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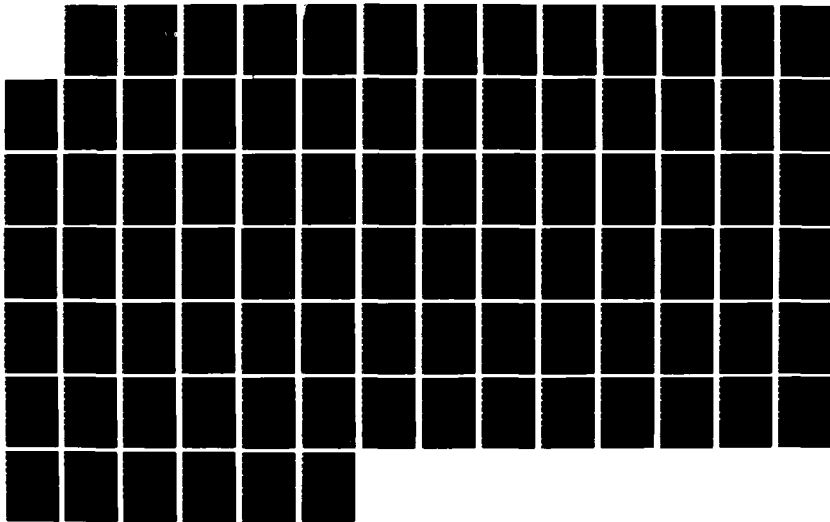
AIR FORCE INTEGRATED READINESS MEASUREMENT SYSTEM
(AFIRMS) WING SUBSYSTEM SPECIFICATION (TACTICAL
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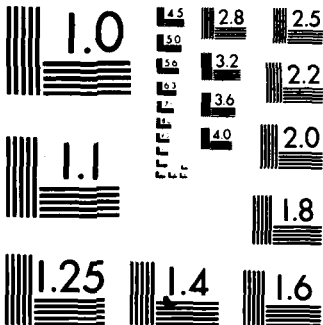
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AIR FORCE INTEGRATED READINESS MEASUREMENT SYSTEM (AFIRMS)

**WING SUBSYSTEM SPECIFICATION
(TACTICAL FIGHTER)**

FINAL

AD-A170 518

Prepared by

**SofTech, Inc.
2000 N. Beauregard Street
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AFIRMS WING SUBSYSTEM SPECIFICATION

TABLE OF CONTENTS

		<u>Page</u>
SECTION	1. GENERAL	1-1
	1.1 Purpose of the Subsystem Specification	1-1
	1.2 Introduction to AFIRMS	1-1
	1.2.1 AFIRMS Synopsis	1-1
	1.2.1.1 Key AFIRMS Concepts	1-1
	1.2.1.2 AFIRMS Functions	1-2
	1.2.2 AFIRMS Documentation	1-3
	1.3 Project References	1-4
	1.4 Abbreviations and Acronyms	1-7
SECTION	2. SUMMARY OF REQUIREMENTS	2-1
	2.1 Wing Subsystem Description	2-1
	2.1.1 Wing Subsystem Architecture	2-3
	2.1.1.1 Central Node Modules	2-3
	2.1.1.2 Functional Areas	2-5
	2.1.1.3 Communications	2-5
	2.2 Wing Subsystem Functions	2-6
	2.2.1 Accuracy and Validity	2-8
	2.2.1.1 Data Accuracy	2-9
	2.2.2 Timing	2-10
	2.3 Flexibility	2-11
SECTION	3. ENVIRONMENT	3-1
	3.1 Equipment Environment	3-1
	3.1.1 Central Node Equipment	3-1
	3.1.2 Functional Area Equipment	3-2
	3.1.3 Input/Output Devices	3-3
	3.1.4 Communications Equipment	3-8
	3.1.4.1 Primary Intrasite Communications	3-8
	3.1.4.2 Secondary Intrasite Communications	3-9
	3.1.4.3 Communications Hardware	3-9
	3.1.5 Environmental and Physical Facilities	3-9
	3.1.5.1 Space	3-10
	3.1.5.2 Electrical Power	3-10
	3.1.5.3 Air Conditioning	3-11
	3.1.5.4 Remote Locations	3-11
	3.1.5.5 TEMPEST Requirement	3-11
	3.2 Support Software Environment	3-11
	3.2.1 Central Node Support Software	3-11
	3.2.1.1 Operating System	3-12
	3.2.1.2 Utility Routines	3-12
	3.2.1.3 Communications Software	3-13
	3.2.1.4 Database Management System (DBMS)	3-13

AFIRMS WING SUBSYSTEM SPECIFICATION

TABLE OF CONTENTS (Continued)

		<u>Page</u>
3.2.2	Functional Area Support Software	3-14
3.2.2.1	Operating System	3-14
3.2.2.2	Utility Routines	3-15
3.2.2.3	Communications Software	3-15
3.2.2.4	Database Management System (DBMS)	3-15
3.2.2.5	Display/Graphics Software	3-15
3.2.2.6	User Interface Software	3-18
3.3	Interfaces	3-22
3.3.1	AFIRMS Intrasite Interfaces	3-22
3.4	Security	3-38
3.5	Controls	3-40
3.5.1	System/Operations Management Controls	3-40
3.5.2	Intrasite Access and Data Flow Controls	3-41
SECTION 4.	DESIGN DETAILS	4-1
4.1	General Operating Procedures	4-1
4.1.1	System Start, Restart, and Stop Times	4-1
4.2	Wing Subsystem Logical Flow	4-2
4.3	Subsystem Data	4-2
4.3.1	Inputs	4-3
4.3.2	Outputs	4-4
4.3.3	Database Description	4-9
4.4	Program Descriptions	4-11
APPENDIX A.	INTRASITE TRANSACTION HEADER	A-1
APPENDIX B.	DATA INTERFACE SPECIFICATIONS	
B.1	Genedit	B-1
B.2	Capability	B-2
B.3	Map	B-3
B.4	Forecasts	B-4
B.5	Bar Chart with Lines	B-5
B.6	Bar Chart	B-6

LIST OF ILLUSTRATIONS

<u>Figure</u>		<u>Page</u>
2-1	AFIRMS Wing Subsystem Architecture	2-4
4-1	AFIRMS Logical Flow	4-2
4-2	AFIRMS Wing Information Flow	4-3

LIST OF TABLES

<u>Table</u>		<u>Page</u>
3-1	PRODUCT DISPLAY SCREEN FUNCTION KEY DESCRIPTION	3-20
3-2	AFIRMS OUTPUT REPORT (CROSS-REFERENCE TO APPENDIX B)	3-24
3-3	DESCRIPTION OF DATA FLOW FOR DATA RETRIEVAL TRANSACTIONS	3-26
3-4	DESCRIPTION OF DATA FLOW FOR DATA UPDATE TRANSACTIONS	3-32
3-5	CNM DATA RETRIEVAL REQUEST INTERFACE SPECIFICATION	3-36
3-6	CNM DATA UPDATE REQUEST INTERFACE SPECIFICATION	3-37
4-1	AFIRMS OUTPUT REPORTS	4-5
4-2	AFIRMS OUTPUT REPORTS BY FUNCTIONAL AREA USER	4-7

SECTION I. GENERAL

1.1 Purpose of the Subsystem Specification. The Subsystem Specification for the wing sites of the Air Force Integrated Readiness Measurement System (AFIRMS), (Contract No. F49642-83-C-0022), is written to fulfill the following objectives:

- a. To provide a detailed definition of the wing subsystem functions.
- b. To communicate specification details of the subsystem functional requirements
- c. To define, in detail, the interfaces with other systems and subsystems and the facilities to be utilized for accomplishing these interfaces.

The subsystem specification also contains, as appendices, the specifications for each of the products required for subsystem implementation.

This subsystem specification generally applies to tactical fighter wings, and only broadly relates to other types of wings. Requirements for various wing types are thoroughly specified during the in-depth analysis that precedes implementation at those wings.

1.2 Introduction to AFIRMS. This section provides a brief introduction to AFIRMS. A more complete description is provided in the AFIRMS Functional Description.

1.2.1 AFIRMS Synopsis.

1.2.1.1 Key AFIRMS Concepts. AFIRMS is an automated, tasking based, capability assessment system. As such, AFIRMS evaluates unit and force capability to perform tasked missions based on the availability of specific resources.

- a. The conceptual requirements for AFIRMS are two-fold:
 - (1) Assessment of combat capability against specific tasking. The user can assess unit/force combat capability against any planned or ad hoc tasking, e.g., War Mobilization Plan (WMP), Operation Plan (OPlan), Fragmentary Order, Air Tasking Order (ATO), Contingency Plan, etc.

- (2) Assessment of combat capability based on budget appropriations. AFIRMS provides a tool for computing long-term readiness and sustainability trends, spanning two to six fiscal years. This tool permits comparison of readiness and sustainability by fiscal year and can therefore highlight the impact of appropriation changes. Thus, changes in funding are related to changes in force readiness and sustainability. Also, senior Air Force decision makers are supported during budget deliberations and Air Force budget allocations.

b. AFIRMS implementation has two key concepts:

- (1) Integrated approach to tasking based capability assessments. AFIRMS has two integrative dimensions. First, all applicable resources and their usage interactions are considered. For example, in sortie capability assessment, AFIRMS evaluates capability in terms of all four essential resource types (aircrew, aircraft, munitions, fuel), their interdependencies, and their generative components (such as spares for aircraft, training qualifications for aircrew, load crews for munitions, and hot pits for fuel). Second, other automated systems (such as the Combat Supplies Management System (CSMS), Combat Fuels Management System (CFMS), Weapon System Management Information System (WSMIS), etc.) outputs are integrated into capability assessment calculations through system interfaces between those systems and AFIRMS.
- (2) Data Quality Assurance. Capability assessment is no better than the data upon which it is based. Therefore, AFIRMS emphasizes a user orientation toward quality assurance of source data. Unit and other data input level users are provided effective tools to accomplish their daily activities and therefore develop a vested interest in AFIRMS data currency and validity. Capability assessment data can then be extracted for use by higher or parallel users with maximum confidence in its validity.

1.2.1.2 AFIRMS Functions. Four basic AFIRMS functions combine to assess readiness capability:

- a. Translate Tasking. As a tasking based capability assessment system, tasking must be converted into a standard format recognized by AFIRMS. Tasking is defined in AFIRMS to the unit level and may consist of actual, hypothetical, standard, or contingency tasking. Any of these taskings can be defined within specified WMP or OPlan constraints, at the option of the user. Likewise, the tasking may be defined by the user for present, historic or future requirements.
- b. Define Resources. The resource definition function of AFIRMS ensures that information about inventory status is available and accurate. Wherever possible, this data is obtained by interface with other functional systems. As with tasking, resource information can be defined for actual, hypothetical, standard, or contingency situations, either present, historic, or future.

- c. **Determine Ability to Perform.** Determining the force's ability to perform is the essential function of AFIRMS. The tasking and resource data are processed to determine how much of the specified tasking can be accomplished with the resources available. Ability to perform is evaluated in terms of the task metric (sorties, etc.) and the cost metric (dollars) to provide readiness/sustainability and dollars to readiness assessments.
- d. **Aggregate, Analyze and Present Data.** Aggregation, analysis and presentation ensure the proper grouping and display of data to provide useful information at the unit, major command and HQ USAF. Aggregation refers to the creation of a composite understanding of capability for several units.

1.2.2 AFIRMS Documentation. A set of nine types of documents describes AFIRMS. A list of these AFIRMS documents is provided below along with a short description of the particular aspects of AFIRMS which are addressed by each document.

- a. **Functional Description (FD).** The FD provides the description of AFIRMS concepts in user terms. It is the baseline document which ties the AFIRMS documents together.
- b. **Economic Analysis (EA).** The EA states AFIRMS estimated costs. It explains the cost factors of AFIRMS implementation alternatives and states the recommended alternative.
- c. **Management Plan.** The Management Plan provides the top-level, integrative frame of reference for the AFIRMS Program. The plan focuses on the processes which provide technical and administrative control of AFIRMS. Key annexes to the Management Plan are the Evolutionary Implementation Plan, the Configuration Management Support Plan, and the Systems Interface Support Plan.
- d. **System Specification.** The AFIRMS System Specification adds the design requirements to the functional concepts in the FD. It divides the system into subsystems (HQ USAF, HQ USAFE (MAJCOM), and Wing (unit)) and assigns functions required within each subsystem. The system specification details the overall architecture, intersite interface gateways, processing logic flows and the communications network specifications.
- e. **Subsystem Specifications.** There are three AFIRMS subsystem specifications: HQ USAF, HQ USAFE (MAJCOM/numbered Air Force), and the Wing (unit/squadron). Subsystem specifications detail the specific design and/or performance requirements of the system at that level. Design details cover the architecture, required functions, the functional users, intrasite interface gateways, and applicable processing logic flows.

- f. Database Specifications. There are three AFIRMS database specifications: HQ USAF, HQ USAFE (MAJCOM/numbered Air Force), and Wing (unit/squadron). These specifications describe the database architecture, size and content, as well as logical data relationships for the functions performed at each of the AFIRMS levels.

- g. Data Requirements Document (DRD). The DRD identifies, categorizes, and groups the generic types of data used in AFIRMS. It also defines each type of AFIRMS data element (attribute class).
- h. Product Descriptions (PDs). The PDs visually portray the products which implement the AFIRMS functions as input and output tools.
- i. Transform and Model Descriptions. The Transform and Model Descriptions Document defines how AFIRMS calculates the output data from the input data. Specific algorithmic calculations are provided. Logical groups of algorithms forming AFIRMS models and transforms are described.

1.3 Project References. Accurate assessment of force readiness and sustainability has been a constant concern of Air Force commanders and their staffs. This concern has been supported by an intensified DoD-wide interest in capability. In response to this Air Force concern, the Directorate of Operations and Readiness initiated the AFIRMS Program. AFIRMS has been under development through a learning prototype and is designed to provide Air Force commanders with a complete, timely, and accurate assessment of their operational readiness and sustainability. In performing this function, AFIRMS provides combat capability assessments to Air Force leaders at HQ USAF, major command (MAJCOM), and wing levels of command to aid them in making total force readiness decisions. AFIRMS also supports day-to-day operations and crisis management as well as planning and programming activities at all command levels.

The Program Management Office (PMO) responsible for contract management of the AFIRMS Learning Prototype Phase (LPP) and this document is the Data Systems Design Office (DSDO/XO), Gunter Air Force Station (AFS), Alabama; the Office of Primary Responsibility (OPR) is the United States Air Force Readiness Assessment Group (AF/X00IM). Three operational centers have been in use as LPP testbed sites: The Pentagon, Washington, D.C.; HQ USAFE, Ramstein Air Base (AB), Germany; and the 52nd Tactical Fighter Wing (TFW), Spangdahlem AB, Germany.

References which are applicable to the history and development of the AFIRMS Program are listed below along with references concerning programming and documentation standards.

- a. AFIRMS Data Requirements Document, Final, SofTech, Contract No. F49642-83-C-0022, 31 May 1985. (Unclassified)
- b. AFIRMS Economic Analysis, Final, SofTech, Contract No. F49642-83-C-0022, 31 May 1985. (Unclassified)

- c. AFIRMS Evolutionary Implementation Plan, Final, SofTech, Contract No. F49642-83-C-0022, 31 May 1985. (Unclassified)
- d. AFIRMS Functional Description, Final, SofTech, Contract No. F49642-83-C-0022, 31 May 1985. (Unclassified)
- e. AFIRMS HQ USAF Database Specification, Final, SofTech, Contract No. F49642-83-C-0022, 31 May 1985. (Unclassified)
- f. AFIRMS HQ USAF Subsystem Specification, Final, SofTech, Contract No. F49642-83-C-0022, 31 May 1985. (Unclassified)
- g. AFIRMS HQ USAFE Database Specification, Final, SofTech, Contract No. F49642-83-C-0022, 31 May 1985. (Unclassified)
- h. AFIRMS HQ USAFE Subsystem Specification, Final, SofTech, Contract No. F49642-83-C-0022, 31 May 1985. (Unclassified)
- i. AFIRMS Product Descriptions, Final, SofTech, Contract No. F49642-83-C-0022, 31 May 1985. (Unclassified)
- j. AFIRMS System Specification, Final, SofTech, Contract No. F49642-83-C-0022, 31 May 1985. (Unclassified)
- k. AFIRMS Transform and Model Descriptions, Final, SofTech, Contract No. F49642-83-C-0022, 31 May 1985. (Unclassified)
- l. AFIRMS Wing Database Specification, Final, SofTech, Contract No. F49642-83-C-0022, 31 May 1985. (Unclassified)
- m. AFIRMS Wing Subsystem Specification, Final, SofTech, Contract No. F49642-83-C-0022, 31 May 1985. (Unclassified)
- n. System Interface Design for the AFIRMS LPP and the Combat Fuels Management System (CFMS), SofTech, Contract No. F49642-83-C-0022, 28 February 1985. (Unclassified)
- o. System Interface Design for the AFIRMS LPP and the Air Force Operations Resource Management System (AFORMS), SofTech, Contract No. F49642-83-C-0022, 2 November 1984. (Unclassified)
- p. AFR 700-2, Information Systems Planning, 26 October 1984. (Unclassified)
- q. AFR 700-5, Information System Requirements Board, 9 November 1984. (Unclassified)
- r. AFR 205-16, Automated Data Processing (ADP) Security Policy, Procedures, and Responsibilities, 1 August 1984. (Unclassified)
- s. AFR 300-4, Vol. 4, Air Force Data Dictionary, 1 May 1984. (FOUO)
- t. DoD-STD-7935.1, Automated Data Systems (ADS) Documentation Standards, 24 April 1984. (Unclassified)

- u. JCS Pub 1, Department of Defense Dictionary of Military and Associated Terms, 24 April 1984. (Unclassified)
- v. AFR 700-1, Managing Air Force Information Systems, 2 March 1984. (Unclassified)
- w. AFIRMS LPP ADP Security Plan, SofTech, Contract No. F49642-83-C-0022, 13 February 1985. (FOUO)
- x. AFR 300-4, Vol. 3, Air Force Data Dictionary, 15 August 1983. (FOUO)
- y. Sustainability Assessment Model (formerly CAC) Functional Description, Contract No. F33700-83-G-002005701, 8 April 1983. (Unclassified)
- z. AFR 700-3, Information Systems Requirements Processing, 30 November 1984. (Unclassified)
- aa. MIL-STD-480 Configuration Control-Engineering Changes, Deviations, and Waivers.
- bb. MIL-STD-483 Configuration Management Practices for Systems, Equipment, Munitions, and Computer Programs.
- * cc. USAF Operational Major Command Functional Area Requirement (FAR), SofTech, Contract No. F49642-82-C-0045, 15 December 1982. (Unclassified)
- dd. AFR 55-15, Unit Combat Readiness Reporting (C-Ratings) (Unit Status and Identity Report (UNITREP), RCS:HAF-XOO(AR)7112(DD)), 22 November 1982. (Unclassified)
- * ee. USAFE Annex to USAF FAR, SofTech, Contract No. F49642-82-C-0045, 20 August 1982. (Unclassified)
- * ff. AFIRMS FAR, SofTech, Contract No. MDA-903-76-C-0396, 14 March 1980. (Unclassified)
- gg. AFIRMS Data Analysis, SofTech, 15 February 1979. (Unclassified)
- hh. User's View of AFIRMS, SofTech, 1 November 1978. (Unclassified)
- ii. AFR 700-9, Information Systems Standards, 15 March 1985. (Unclassified)
- jj. AFM 11-1, U.S. Air Force Glossary of Standardized Terms, Vol. 1, 2 January 1976. (Unclassified)

* Material contained in references cc and ee expands on that found in reference ff.

- kk. AFIRMS Data Automation Requirement (DAR), Final, SofTech, Contract No. MDA-903-76-C-0396, 14 March 1980. (Unclassified)
- ll. JCS Memorandum of Policy 172, 1 June 1982. (Unclassified)
- mm. Federal Information Processing Standards Publication (FIPS PUB) 1.
- nn. FIPS PUB 15, Section 1.
- oo. Military Airlift Command (MAC) AFIRMS Requirements Analysis, SofTech, Contract No. F49642-83-C-0022, 30 September 1985. (Unclassified)
- pp. Analysis of Strategic Air Command (SAC) Capability Assessment Metrics, SofTech, Contract No. F49642-83-C-0022, 30 September 1985. (Unclassified)
- qq. Strategic Air Command (SAC) AFIRMS Requirements Analysis, SofTech, Contract No. F49642-83-C-0022, 30 September 1985. (Unclassified)
- rr. Analysis of Strategic Air Command (SAC) Capability Assessment Metrics, SofTech, Contract No. F49642-83-C-0022, 30 September 1985. (Unclassified)

1.4 Abbreviations and Acronyms.

AB	- Air Base
ADP	- Automated Data Processing
ADPS	- Automated Data Processing System
AF	- Air Force
AFIRMS	- Air Force Integrated Readiness Measurement System
AFR	- Air Force Regulation
AFS	- Air Force Station
ANSI	- American National Standards Institute
ASCII	- American Standard Code for Information Exchange
ATO	- Air Tasking Order
ATOC	- Allied Tactical Operations Center
BPI	- Bits Per Inch
BPS	- Bits Per Second
CAMS	- Core Automated Maintenance System
CAS	- Combat Ammunition System
CBU	- Cluster Bomb Unit
CFMS	- Combat Fuels Management System
CN	- Central Node
CNM	- Central Node Module
CONPLAN	- Concept Plan
CONUS	- Continental United States
CPI	- Characters Per Inch
CPL	- Characters Per Line
CPS	- Characters Per Second
CPU	- Central Processing Unit
CRC	- Cyclical Redundancy Checking

CRT	- Cathode Ray Tube
CSMS	- Combat Supplies Management System
DAR	- Data Automation Requirement
DBMS	- Database Management System
DDN	- Defense Data Network
DoD	- Department of Defense
DRD	- Data Requirements Document
DSDO	- Data Systems Design Office
EA	- Economic Analysis
EIP	- Evolutionary Implementation Plan
EMSEC	- Emanations Security
FA	- Functional Area
FAW	- Functional Area Workstation
FD	- Functional Description
FIPS PUB	- Federal Information Processing Standards Publication
FOUO	- For Official Use Only
FTP	- File Transfer Protocol
HOL	- High Order Language
HQ USAF	- Headquarters, United States Air Force
HQ USAFE	- Headquarters, United States Air Forces Europe
IAW	- In Accordance With
I/O	- Input/Output
IP	- Internet Protocol
IPS	- Inches Per Second
ISO	- International Standards Organization
LED	- Light Emitting Diode
LPI	- Lines Per Inch
LPM	- Lines Per Minute

LPP	- Learning Prototype Phase
MAC	- Military Airlift Command
MAJCOM	- Major Command
MICAP	- Mission Capable
NATO	- North Atlantic Treaty Organization
NBS	- National Bureau of Standards
NSA	- National Security Agency
OCR	- Optical Character Reader
OPlan	- Operation Plan
OPORD	- Operation Order
OPR	- Office of Primary Responsibility
PD	- Product Descriptions
PMO	- Program Management Office
POL	- Petroleum, Oil, and Lubricants
POM	- Program Objective Memorandum
PPL	- Preferred Products List
SMTP	- Simple Mail Transfer Protocol
TAF	- Tactical Air Force
TCP	- Transmission Control Protocol
TFW	- Tactical Fighter Wing
USAFE	- United States Air Forces Europe
WIN	- WWMCCS Intercomputer Network
WMP	- War Mobilization Plan
WOC	- Wing Operations Center
WSMIS	- Weapon System Management Information System
WWMCCS	- World Wide Military Command and Control System

SECTION 2. SUMMARY OF REQUIREMENTS

AFIRMS is a tasking based capability assessment system that assesses readiness and sustainability by applying specific tasking (identified to accomplish the assessments desired) against selected unit and theatre resources through the use of automated assessment models. As a decision support tool, it provides Air Force commanders at all levels with the ability to assess capability to meet a specific tasking. The requirement for AFIRMS is two-fold:

- a. Assess capability against any tasking. The operator of the system can select a tasking against which to make assessments, i.e., War Mobilization Plan (WMP), Operations Plan (OPlan), what-if plan, and Air Tasking Order (ATO). AFIRMS then provides a capability assessment against that scenario in a mission unit of measure.
- b. Correlate dollar costs to readiness assessment impacts of appropriations by fiscal year. The capability metric transformed from missions to dollars for assessments from this budgetary perspective.

The worldwide operational AFIRMS is a hierarchically structured system which can be visualized as a pyramid of distinct operational sites. Each operational site performs a set of functions which are distinct from, although similar to, other sites and transmits information logically upward to a parent site. There are three basic levels within the AFIRMS pyramid, each level being considered as an AFIRMS subsystem. The highest level subsystem, the apex of the pyramid, is the HQ USAF subsystem. The second level of the pyramid consists of the MAJCOM subsystems. Each Major Command contains at least one AFIRMS MAJCOM subsystem; one for the MAJCOM HQ, and one for each Numbered Air Force (or Air Logistics Center) in the MAJCOM, as applicable. The base of the pyramid is composed of a set of wing subsystems. Each wing within a MAJCOM contains an AFIRMS wing subsystem which is connected to the parent MAJCOM.

2.1 Wing Subsystem Description. The wing sites in the operational AFIRMS are the lowest level entities in the eventual worldwide AFIRMS distributed network. Wing sites receive tasking data from higher command levels and communicate readiness and status data to the MAJCOMs. Each wing is subordinate to a particular MAJCOM.

Although multiple types of wings exist (e.g., fighter, airlift, etc.), they have common characteristics. The AFIRMS wing sites provide products to support the major function of the wing. In the case of tactical fighter wings, that is to produce combat sorties.

AFIRMS wing products provide capability assessment insights that assist in objectively:

- a. Evaluating a wing's ability to accomplish tasking directed by higher levels of command.
- b. Determining capability to generate sorties in support of specific tasking.
- c. Executing taskings.
- d. Identifying and reporting shortfalls related to tasking, and relating shortfalls to specific resource deficiencies.
- e. Reporting capability up the chain of command.
- f. Projecting capability.

AFIRMS wing products present a look at wing resources from operations, maintenance, and support squadron functional areas, and provide an integrated assessment of readiness and sustainability using wing resources. Due to the inherent differences in missions, wing types vary in the resource data they collect and the assessment products they require. However, products developed for a particular wing within a specific MAJCOM generally service all applicable agencies of that wing.

Two basic types of data are processed by the wing; tasking data and resource data.

- a. **Tasking Data.** Wing tasking data consists of (but is not limited to): ATOs, preplanned missions, and immediate requests (i.e., from Allied Tactical Operations Center (ATOC)). This tasking data is received at the wing via a communications link with the MAJCOM/ATOC, and processed by the wing subsystem against the TFW squadron resources. Tasking data received "manually" is keyed into the wing subsystem via user terminal.
- b. **Unit Resource Data.** Wing resource data is received from the squadrons by means of manual on-line terminal entries or interfacing with external systems. The general approach is to extract data from existing systems to the maximum extent possible. Data unavailable from other systems is entered manually. As data becomes available from newly developed systems, a conversion can be made from manual entry to automated collection from the new system. Some MAJCOMs have centralized resource storage sites for distribution to the units during a crisis. When these resources are to be used in the wing assessments, the MAJCOM provides the wing with the resupply schedule.

Each CNM is responsible for updating the FA databases attached to it as required. It is also responsible for transmitting the data updates made by one or more of its attached FAs to all other CNMs to allow them to update their FA databases as required.

2.1.1.2 Functional Areas. Each FA has an intelligent device containing its own database and copies of required software.

The data resident on the FA database consists of update/read and read only data elements. The specific data resident is determined by the data needed for a functional area's normal uses. See the Wing Database Specification for details of the data requirements by functional user. When an update is made at the FA, the update transaction is sent to the central node to allow update of the centralized database and for synchronization of the databases of other FAs.

2.1.1.3 Communications. A communications path is provided for normal communications with a higher level site. In addition to this normal channel which is shared between all CNMs, each CNM has an alternate temporary path to the MAJCOM site. Since this alternate path is variable in nature, the software is capable of communicating using a variety of protocols and speeds.

A communications path is provided for normal communications between a FA device and a CNM. In addition to this normal channel, each FA has an alternate temporary path of communications (i.e., a dial-up phone line). The MAJCOM CNM has the required receiving equipment to accept the alternate path transmission. It is possible for the wing FA to use the alternate transmission path to link directly to a CNM at the MAJCOM. Interface specifications for these alternate FA communications paths, as well as the determination as to which FAs require this wing specific functionality, are defined during the Analysis Phase of each functional block implementation.

2.2 Wing Subsystem Functions. Three levels of functions are of interest in this subsystem specification. They are: Basic AFIRMS Functions, Secondary Functions, and System Functions.

- a. Basic AFIRMS Functions. The building block functions which are specific to AFIRMS and which are used (in different forms and combinations) to support the user with various types of data/information. The Basic AFIRMS Functions at the wing level are:
 - (1) Translate Tasking. Translates tasking so that it can be used in measuring ability to perform, i.e., converts tasking to numbers of mission capable aircraft, mission ready crews, munitions, Petroleum, Oil and Lubricants (POL), etc. required to accomplish that tasking. Wing products that use this function include:
 - (a) Aircraft Tasking
 - (b) Aircrew Generation
 - (c) Flying Schedule
 - (d) Mission Flow
 - (e) Mission Profile Definition
 - (f) Munitions Flow
 - (g) Order Assignments
 - (h) Tasked Missions
 - (i) Tasked Munitions
 - (j) Tasking Information
 - (k) War Mobilization Plan
 - (l) Wing Flying Day
 - (m) Wing Operations Rates
 - (2) Define Resources. Provides inventory status and availability of resources (such as fuels, munitions, aircraft, and crews) for use in capability assessments. The Define Resources function will assist in allocation of resources (physical or fiscal) and forecast results of trial or final allocations. Wing products that use this function include:
 - (a) AGE Availability Status
 - (b) Aircraft Availability
 - (c) Aircraft Status

- (d) Aircrew Availability
 - (e) Aircrew Status
 - (f) Fuels Status
 - (g) Munitions A & D Availability
 - (h) Munitions Availability Forecast
 - (i) Munitions Load Crew Status
 - (j) Munitions Status
 - (k) Supply MICAP Status
 - (l) Wing Resource Summary
 - (m) Wing Resupply Schedule
- (3) **Determine Ability to Perform.** Given current and forecast readiness factors, AFIRMS transforms WMPs, ATOs, OPlans, and "what-if" exercises into measurable tasking; computes current readiness to perform the task, projects readiness into the future; and calculates resources consumed by performing the task. This function will provide users with the capability to measure (and aggregate) readiness and sustainability vs. standard or one-time tasking, and measure (and aggregate) readiness or sustainability vs. revised standards, and/or revised standard tasking using historic data.

Wing products that use the Determine Ability to Perform function include:

- (a) Aircraft Capability
 - (b) Aircrew Capability
 - (c) Base Fuels Capability
 - (d) Individual Resource Capability
 - (e) Integrated Capability
 - (f) Munitions Capability
 - (g) Sortie Generation Model
 - (h) Task Capability
- (4) **Aggregate, Analyze and Present Data.** This function deals with the task of properly grouping data to provide meaningful and useful data. It also develops trend and variance data to facilitate exception type reporting on unusual developments in day-to-day data.

Aggregation refers to the creation of a composite understanding of the readiness and sustainability of a number of units. Thus, a MAJCOM with many reporting wings, each with its own deficiencies and strengths, can assess the readiness (and sustainability) of all units taken as a whole.

Wing products that use the Aggregate, Analyze, and Present Data function include:

- (a) Base Status Report Generation
 - (b) Resource Summary Report Generation
 - (c) Unit Status Report Generation
- b. Secondary AFIRMS Functions. In order to carry out the Basic AFIRMS Functions, AFIRMS must maintain and verify data. To help ensure the accuracy of the data and to take advantage of its availability, AFIRMS provides a variety of associated capabilities which are not directly related to capability assessment. These functions are secondary and some of them might be eliminated if the circumstances in which AFIRMS operates were to change. Examples of these secondary functions are: display tasking; perform ad hoc queries; and display information on an evolving schedule. For a detailed listing of these functions, refer to the AFIRMS System Specification.
- c. System Functions. The standard building block functions such as graphics or data mangement which might occur in any system, and which, together with specially written subfunctions, are used to support the Basic and Secondary AFIRMS Functions. For a detailed listing of these functions, refer to the AFIRMS System Specification.

2.2.1 Accuracy and Validity. The accuracy of the AFIRMS database is essential for the generation of accurate measurements. There are two categories of accuracy and validity that must be addressed. The first is related to electronic manipulation, storage, and transmission of data in the AFIRMS system. The second is related to the interface between the user or other Air Force systems, and the AFIRMS system.

- a. Electronic Manipulation/Storage/Transmission.
- (1) The nature of the models/displays created with AFIRMS does not require precision beyond that achievable with off-the-shelf standard micro or minicomputers that support hardware or software floating point computations.
 - (2) Errors in data transmissions will not exceed 1 part in 10^9 . Parity checking and cyclical redundancy checking (CRC) ensure that the data actually used internal to the AFIRMS sites has an error probability well below this figure by correcting all 1-bit errors. (Double-bit errors are detected but not corrected.)

- b. **User Interfaces to AFIRMS.** The user interfaces of interest are those interfaces that introduce new information into AFIRMS. The concern is that the information destined to enter the database be valid. Valid here means that:
 - (1) The individual entering the information is authorized to do so (i.e., only logistics personnel may be authorized to update logistics information, using logistics data forms).
 - (2) The information is as "error free as possible." This suggests that input data must, in general, be entered through well-engineered interfaces that prompt the user and check field contents.
 - (3) Certain information passed into the database has sufficient criticality to require verification beyond that identified in (2) above, prior to database updates. This verification occurs via supervisory review. Under this method, the data is entered by an authorized individual. However, the information cannot update the database or be transmitted to higher headquarters by the individual who entered it until a supervisor authorizes the AFIRMS system to accept the data. The method of authorization might require that the supervisor log on to the AFIRMS system and enter an "unlocking" command that allows the data to be entered and the database updated. Information requiring supervisory review is kept minimal. Specific data requiring this quality assurance technique are identified during the Analysis Phase of each functional block implementation.
- c. **System Interfaces to AFIRMS.** Data obtained by interface with other data systems is subject to the same data accuracy and validity criteria as for user input data.

2.2.1.1 Data Accuracy. AFIRMS uses five main approaches to ensure the accuracy and currency of data.

- a. Provide benefits to the organizations which input readiness data. If the organization which inputs data receives benefits from the system, then it is motivated to ensure that data entered is current and accurate.
- b. Simplify data input by using simple devices and by grouping inputs. For example, a bar code reader is a candidate device for entering a complex identification number that might be subject to error if entered via keyboard.
- c. Use automated edit check as well as checks for the reasonableness of input data against stored parametric values. That is, all inputs are programmatically edited to further ensure the accuracy and integrity of the database. The system validates length, format, and legal values of all formatted alphanumeric input data.

- d. All data entry information is automatically reviewed/checked for consistency against other related information.
- e. Obtain, edit, and incorporate data and/or assessments from other automated systems.

2.2.2 Timing.

- a. User Response Time. AFIRMS is an information processing system which is user intensive; that is, in general, users enter data through a data capture device and request readiness status onto an output display. Thus, it is imperative that AFIRMS response time to user requests be kept minimal. Response time as it applies to user terminals, consists of two parts; command acceptance and command execution.
 - (1) Command Acceptance. Command acceptance is the time between the user's initiating transmission of a command or transaction to the system (such as by depression of the ENTER key or entry of the last character of a menu response) and the appearance of the first line of the acknowledgement from the system on the user's terminal that the message has been received or an error condition exists. AFIRMS, under loaded conditions (more than 85% of terminals in use) supports a command acceptance time of less than 2.5 seconds 90% of the time. At no time does command acceptance time exceed six seconds.
 - (2) Command Execution. Command execution is the elapsed time between the command or transaction entry, and the appearance of the first line on the user's display terminal (excluding graphics).
 - (a) For functions such as command entry, text editing or message writing applications, the appearance of a keyed character on the screen is immediate in the perception of the user.
 - (b) Queries. AFIRMS allows for local (intrasite) queries only, with response times as follows:
 - 1 Simple. Response time of 1 to 3 seconds.
 - 2 Medium. Response time of 4 to 10 seconds.
 - 3 Complex. Response time of 11 to 30 seconds.

Categorization of specific queries within these definitions is accomplished during the Analysis Phase of the functional block developments. These times do not include sortie generation model, dollars to readiness model, or similar model execution times.

- b. **Data Currency.** When changes are made to data at the functional area level, those changes are transmitted to the central site database. After the central database is updated, the changes are subsequently transmitted to other functional areas having the data in question resident on their local database. The time that it takes to complete the transactions on the central database and all affected functional areas designates the currency of data at the site.
 - (1) **Mission-Related Data** - Within a site this time period must be less than three minutes for mission-related data 90% of the time with the system operating in a normal mode. AFIRMS mission-related data consists of current tasking and current primary resource status information or that data associated with a crisis mode. Primary resources are those resources directly utilized by the capability assessment model.
 - (2) **Non-Mission-Related Data** - Data currency within a site must be achieved within one hour for non-mission-related data 90% of the time with the system operating in a normal mode. AFIRMS non-mission-related data consists of that information relating to ad hoc, historic, exercise, or contingency simulations which neither relate to the current situation nor are designated as crisis mode items.
- c. **Data Age.** The maximum time span allowed for known data updates between wing and MAJCOM sites is six hours, regardless of state of change for the data.

2.3 Flexibility. AFIRMS provides an architecture that matches the specific requirements of each wing to an AFIRMS site with compatible hardware/software capability. Additionally, it has the capability to grow, i.e., add/change system focus as time passes. Capabilities incorporated for adapting the wing subsystem to changing requirements include the following:

- a. Configuration of AFIRMS sites from modular hardware and software components. The modular applications software is written in DoD standard host independent high order languages (HOL) for ease of transportability among different hardware configurations. Acceptable HOLs are ADA, C, or other strongly typed languages which support modular software design, readability and increased maintainability.
- b. A hardware/software building block approach, coupled with transportable software, to facilitate expansion of operational AFIRMS in the future.
- c. Utilization of DoD standardized data communications protocols and external user interfaces. AFIRMS implements DoD standard protocols for network and distributed system data communications and terminal interfaces. Utilization of the DoD standard protocols provides for interoperability among different vendor equipments, existing and developmental Air Force Automated Data Processing (ADP) systems, and is in accordance with Air Force policy and guidance.

- d. Ability to interface an AFIRMS site to other Air Force systems after the AFIRMS site has been designed and installed. AFIRMS software is structured so as to provide for new system integration to the greatest extent possible. This is facilitated by maintaining distinct layers of software, as in the International Standards Organization (ISO) 7-layer Reference Model, and by the use of controlled standardized data gateways (intersite or intrasite standard data communications formats).
- e. Ability to support secondary (or backup) interfaces, by which an intermediate AFIRMS site may be bypassed. For example, the ability of a functional area, in place or deployed, to communicate directly with a MAJCOM or the ability of a wing, in place or deployed, to bypass the MAJCOM and communicate directly with HQ USAF.

SECTION 3. ENVIRONMENT

3.1 Equipment Environment. The wing site is configured to support Wing Headquarters and the Wing Operations Center (WOC). In addition, each squadron affiliated with the wing has equipment that "plugs-into" the wing hardware. Equipment is provided to each wing (and all other AFIRMS sites) on an "as needed" basis. AFIRMS will not directly support unit level automation. It is the intent of AFIRMS to use existing facilities and equipments wherever possible. However, at a minimum, each AFIRMS site contains the equipment required for the Central Node and one Functional Area workstation. The Central node contains the AFIRMS database for that site as well as the communications support for site to site communications.

AFIRMS utilizes standard Air Force equipment sources such as the Air Force Standard Multiuser Small Computer initiative by the Air Force Computer Acquisition Center, TEMPEST and Phase IV Program equipment sources. AFIRMS is designed to allow for the integration of different computers, peripherals, and communications standards throughout the system. This provides for a faster and more cost effective AFIRMS development, and a higher degree of operational flexibility.

3.1.1 Central Node Equipment. Each AFIRMS site contains a Central Node consisting of the following equipment:

- a. One or more processors, each capable of handling four or more functional areas. Each processor is a 32-bit machine with at least a 24-bit address structure. Each processor has several high bandwidth full duplex communications paths to the other processors, if any, in the central node. Each processor has the ability to connect three or more terminals.
- b. One or more direct access, high speed storage devices capable of containing the centralized data base and capable of being logically accessed by multiple processors. Each high speed storage device has at least one high bandwidth full duplex communications path to each of the processors in the central node.
- c. One direct access, high speed storage device capable of containing all software and system files for each processor in the Central Node.
- d. A mass storage device, i.e. 9-track tape or optical storage device, capable of being accessed by multiple processors.
- e. A communications controller capable of handling all external communications lines and capable of being accessed by multiple local processors.

- f. Encryption devices for each physical line that may pass classified data. The encryption device is able to operate in a synchronous or asynchronous mode and to operate at the speeds identified in Section 3.1.4 of this subsystem specification, "Communications Equipment".
- g. Power conditioning and failure protection mechanisms are required as stated in Section 3.1.5.2 of this subsystem specification, "Electrical Power". All "wall power" must be filtered to protect equipments against power surges. Filtered power is also required for system that process classified data to prevent data emanations. Power failsafe backup provisions are provided to preserve memory in the event of power failure. Backup power terminates during normal shutdown.
- h. A CRT terminal and line printer for system maintenance and operator use.
- i. Main Memory. An initial user memory capacity of a minimum of four megabytes of user memory is required. This user memory is expandable (in minimum 512K byte increments) up to at least 10 megabytes. All memory specifications are made in 8-bit bytes. The physical organization of the main memory is modular so that a failure in one module (except the module containing the operating system or similar support software) does not deprive the system of the remaining memory. Memory must be byte addressable and volatile.
 - (1) Error Detection. As a minimum, a memory error detection and correction feature are provided that detect double bit errors and correct all single bit errors for each byte of memory.
 - (2) Memory Protection. The capability to inhibit any attempt by an applications program to write into or read from memory areas not allocated to that program is required.

3.1.2 Functional Area Equipment. Each functional area which needs to access, enter, or modify AFIRMS data is provided with a functional area workstation to communicate with the Central Node. Each functional area workstation contains the following equipment:

- a. One processor capable of handling one or more users depending on the needs of the functional area. The processor is, at a minimum, a 16-bit machine.
- b. One direct access, high speed storage device capable of containing the local database and the software/system files.
- c. A mass storage device, e.g. floppy disk drive.
- d. A communications controller capable of handling all external asynchronous/synchronous communications between the functional area workstation and the central node.

- e. Several miscellaneous input/output devices. The number of each type of device depends on the requirements of the functional area, and is determined during the Analysis Phase that precedes implementation at each site.
- f. An encryption device for communicating with the Central Node if the workstation is to handle classified data. The encryption device is able to operate either in a synchronous or asynchronous mode and to operate at the speeds required by the communications lines.
- g. Power conditioning and failure protection mechanisms are required. All "wall power" must be filtered to protect equipments against power surges. Filtered power is also required for systems that process classified data to prevent data emanations. Power failsafe backup provisions are provided to preserve memory in the event of power failure. Backup power must terminate during normal shutdown.
- h. Main Memory. An initial user memory capacity of a minimum of two megabytes of user memory is required. This user memory is expandable (in minimum 512K byte increments) up to at least 8 megabytes. All memory specifications are made in 8-bit bytes. The physical organization of the main memory is modular so that a failure in one module (except the module containing the operating system) shall not deprive the system of the remaining memory.
 - (1) Error Detection. As a minimum, a memory error detection and correction feature is provided that detects double bit errors and corrects all single bit errors for each byte of memory.
 - (2) Memory Protection. The capability to inhibit any attempt by an applications program to write into or read from memory areas not allocated to that program is required.

3.1.3 Input/Output Devices. Wing device requirements for CRT terminals, printers, disk drives and magnetic tape drives are determined during the Analysis Phase of each block implementation.

- a. CRTs must possess the following characteristics:
 - (1) Monochrome Terminals: Alphanumeric keyboard and video display; interface via standard RS-232-C port; ability to function as a system console; and sound an audible tone or "BEEP" when the ASCII "BEL" character or its equivalent is received.
 - (a) Keyboards must possess the following characteristics:
 - 1 Be capable of generating the ASCII 128-character subset in accordance with FIPS PUB 1.
 - 2 At a minimum, conform to the ANSI Standard X4.14-1971.

- 3 Have a repeat function for all printable ASCII characters, cursor controls, and spacing functions.
- 4 Have separate keys for carriage return, control, escape, and spacing functions.
- 5 Have a minimum of 16 programmable function keys.
- 6 Have a numeric keypad to the right of the character keys and allow numeric entries from either the regular character key or the numeric keypad.
- 7 Have at least four cursor movement keys separate from function keys.
- 8 Have a detachable keyboard.
- 9 Have a (screen) hardcopy function.

(b) Video Displays must possess the following characteristics:

- 1 Display a minimum of 24 lines of 132 characters each.
- 2 Characters displayed consist of the ASCII 95-character subset IAW FIPS PUB 15, Section 1.
- 3 If the dot matrix character generation technique is used, the matrix must be at least 7x9.
- 4 Full descenders will be used on the lower case such as "g, j, p, q, y" and appropriate special characters.
- 5 Implement a visible cursor denoting the next character position in such a manner that its location is obvious to the operator and does not obscure any information (excluding underline) which may be displayed at that position.
- 6 The cursor must be addressable and the capability must be provided for the applications program to clear the display and to position the cursor at any location on the screen.
- 7 Have a non-glare viewing surface.
- 8 Provide reverse video, bold, blink, and underscore capabilities under application program control.
- 9 Brightness must be externally adjustable by the terminal operator.
- 10 The display must be green or amber.
- 11 Have selectable terminal transmission rates of 300, 1200, 2400, 4800, and 9600 bits per second (bps).

- 12 Have a minimum 11-inch screen measured diagonally.
- 13 Have smooth scrolling capability.
- 14 Support shading and marking patterns (preprogrammed and programmable).

(c) Other Required CRT Terminal Characteristics:

- 1 Local memory
- 2 Built-in diagnostics and testing
- 3 TEMPEST certified - for terminals which display classified information
- 4 Screen print function

(2) Color Graphics Terminals must possess the following characteristics:

- (a) Minimum of 16 special function (programmable) keys. Refer to Table 3-1 for some of the required function key features.
- (b) 10% of the terminals require a video interface board for use with video projectors
- (c) Screen definition of not less than 720x484 individually addressable and color definable pixels (i.e., medium resolution)
- (d) Minimum 11" CRT screen
- (e) TEMPEST certified - for terminals which display classified information
- (f) Support 9600 baud rate
- (g) Display a minimum of 16 colors
- (h) Screen print function

b. Printers must possess the following characteristics;

(1) Letter Quality Printers must:

- (a) Print at least 55 characters per second (CPS).
- (b) Print at least 132 characters per line (CPL).
- (c) Have a pressure-feed mechanism, interchangeable tractor feed and an automatic single sheet feeder.
- (d) Print the complete 95 character ASCII subset IAW FIPS PUB 15, Section 1.

- (e) Have operator selectable print spacing of 10 pitch, 12 pitch, and proportional spacing.
 - (f) Accept forms from 4 1/2 to at least 14 7/8 inches in width.
 - (g) Print clearly using up to 3 part paper.
 - (h) Interface via RS-232-C serial port and parallel port.
 - (i) Provide at least one font which is readable by an optical character reader (OCR).
 - (j) Provide clearly marked vertical and horizontal forms alignment that indicate the standard first print position.
 - (k) Have operator controls for power online/offline, advance to top of form and manual adjustment of vertical and horizontal paper alignment.
 - (l) Be TEMPEST certified, when used for classified information printout.
- (2) Dot Matrix Printers must possess the following characteristics:
- (a) Print at least 200 CPS at 132 characters per line at 10 characters per inch (CPI).
 - (b) Have dot addressable graphics with a minimum resolution of 70 dots per inch vertical and horizontal.
 - (c) Provide correspondence quality print capability of at least 40 CPS at 10 CPI.
 - (d) Use an operator adjustable pin feed tractor for positive form registration movement.
 - (e) Print the complete 95 character ASCII subset IAW FIPS PUB 15, Section 1.
 - (f) Accept forms ranging from 4 1/2 to 14 7/8 inches in width.
 - (g) Print full descenders used on the lower case characters "g, j, p, q, y" and appropriate special characters.
 - (h) Print 6 and 8 lines per inch (LPI), operator selectable.
 - (i) Print clearly using up to 3 part paper.
 - (j) Have controls for power, online/offline, advance to top of form and manual adjustment of vertical and horizontal paper alignment.
 - (k) Provide clearly marked vertical and horizontal forms alignment that indicate the standard first print position.

- (l) Provide program control of line feed and form feed.
 - (m) Interface via RS-232-C serial port and parallel port.
 - (n) Be TEMPEST certified.
- (3) High Speed (Line) Printers must possess the following characteristics:
- (a) Print at least 500 lines per minute (LPM) (at 132 CPL) using the character set specified in (b) below.
 - (b) Print the complete 95 character ASCII subset IAW FIPS PUB 15, Section 1.
 - (c) Support horizontal spacing of 10 or 12 CPI.
 - (d) Have vertical spacing of 6 or 8 LPI switch or programmer selectable.
 - (e) Print at least 132 characters per line.
 - (f) Print clearly using up to 3 part paper.
 - (g) Have vertical format control via programmer or printer.
 - (h) Be TEMPEST certified.
 - (i) Have a diagnostic light-emitting diode (LED) indicator for status.
 - (j) Interface via RS-232-C serial port and parallel port.
- (4) Color Graphics Printers must possess the following characteristics:
- (a) Plot the displayed graph in the same ratio (horizontal to vertical) as the screen display, in no more than 90 seconds.
 - (b) Provide minimum resolution of 100x85 horizontal to vertical dots per inch.
 - (c) Print at least eight colors.
 - (d) Print on bond paper and transparency (developing of transparency not acceptable).
 - (e) Interface via RS-232-C serial port or parallel port.
 - (f) Accept a minimum paper size of 8.5x11 inches.
- c. Floppy/Microfloppy Disk Drives must possess the following characteristics:
- (1) Minimum of two read/write heads to provide access to double-sided disks.
 - (2) Provide a formatted storage capacity for one diskette of at least 1.5 megabytes.

- (3) Use, at a minimum, a 5.25 inch double sided/double density diskette for floppy disk drives and 3.5 inch diskette for microfloppy disk drives.
- (4) Be compatible with FA workstation hardware selection.
- d. Magnetic Tape Drives must possess the following characteristics:
 - (1) Be nine (9) track.
 - (2) Support a 10.5 inch reel of .5 inch by 2400 foot standard reel tape.
 - (3) Support speed read/write operations at a minimum of 75 inches per second (IPS), streaming at a minimum of 200 IPS.
 - (4) Perform error checking on all read operations.
 - (5) Perform a read after write with error checking on all write operations.
 - (6) Have write protection and beginning and end of tape sensor.
 - (7) Support a minimum of dual-density (1600/6250 bits per inch (BPI)) tape read and write capability.

3.1.4 Communications Equipment. Communications equipment is provided to supply both a primary and a secondary secure communications path to all higher level sites. Requirements for specific types and quantities of communications hardware are determined during the analysis phase that precedes implementation of each functional block at each site.

3.1.4.1 Primary Intrasite Communications. Primary communications equipment between central nodes and functional area workstations provides the following capabilities:

- a. Encryption of classified data transmitted to and from a functional area.
- b. A transmission rate of 9600 baud and greater.
- c. A 24 hour a day dedicated line from the central node to each functional area workstation.
- d. Conditioning to a bit error rate of 1 in 10^9 .

3.1.4.2 Secondary Intrasite Communications. Secondary communications equipment provides the following capabilities:

- a. Encryption of data transmitted between sites and classified data transmitted between a functional area and its central node.
- b. A transmission rate of 300 baud and greater, using either asynchronous or synchronous equipment.
- c. Multiple physical paths for a single logical path (i.e. rerouting).
- d. Availability, as required, in the event primary communications fail. Over a given 24-hour period, secondary media are accessible at least 80% of the time.

3.1.4.3 Communications Hardware.

- a. Modems:
 - (1) Limited Distance Modems. Limited distance modems are required for on-base use. The modems must be capable of operating over available non-conditioned voice grade telephone lines at distances of at least 6 miles. The following characteristics are required:
 - (a) Switchable and capable of transmitting and receiving data at rates of 300, 600, 1200, 2400, 4800, and 9600 bits per second (BPS) up to 6 miles.
 - (b) The limited distance modem shall meet EIA Standard EIA-RS-232-C/CCITT Recommendation V.24 for interfacing with external equipment.
 - (2) Long Distance Modems. Modems used outside the United States (Europe, Asia) on non-conditioned commercial telephone lines. The modem is a CODEX/V.29 data modem model 21962 and must be homologated (PTT option) to the country where the system is installed. The CODEX Universal PTT option, Product code 22120, is provided when required.
- b. Line Drivers. Line drivers are required to boost the electronic signal for communications between modems and CRTs over long distances (i.e., 75 feet or more).
- c. Encryption Devices. NSA-endorsed Data Encryption Standard (DES) devices are required. Functionality may be combined for encryption devices and long/limited distance modems.

3.1.5 Environmental and Physical Facilities. AFIRMS equipment must operate throughout the ranges of electrical power and environmental tolerances stated below.

3.1.5.1 Space.

- a. **Site Locations.** Systems are installed at various Air Force installations in Europe. The central node location space ranges from a minimum of 20 square feet for the smallest configuration, to a maximum of 200 square feet for the largest configuration.
- b. **Flooring.** Equipment shall not require raised flooring. The flooring may be carpeted. There will be no special static control facilities.
- c. **Ceiling Height.** The distance from the floor surface to the u. obstructed ceiling is at least 8 feet.
- d. **Access Route.** Equipment is installed in buildings with access being the size of a normal office doorway. Additionally, some equipment is installed in facilities with vault doors, raised thresholds, and access by stairways. Some facilities are established computer facilities with a double door access route.

3.1.5.2 Electrical Power. All equipments must be capable of operating within the requirements of MIL-E-4158 and are further defined by the following:

- a. Voltage regulation steady state +10% to -15%
- b. Voltage disturbances 30% for less than 0.5 seconds
 Momentary undervoltage -100% acceptable to 20 milliseconds
 Transient overvoltage 200% for less than 20 milliseconds
 Surges IAW IEEE 587-1980
- c. Voltage harmonic distortion +3% -5% (with linear load)
- d. Frequency variation 50/60Hz plus or minus 1Hz
- e. Frequency variation rate of change 1Hz/second
- f. Power factor 0.8
- g. 220/240 Volts +or-10%, single phase, 2 wire.
- h. 105/110 Volts +or-10%, single phase, 2 wire.

In addition to the requirements outlined in (1) through (8) above, it is desirable that deployable equipments operate using an Air Force 25KVA generator and that they be ruggedized for handling, ground transportation, and air transport in accordance with the requirements of MIL-STD-810. An electrical power fault detection device is provided to prevent equipment failure (e.g., disk head crash).

3.1.5.3 Air Conditioning. The ambient temperature will be maintained between 60 and 90 degrees Fahrenheit with a relative humidity of between 20 and 90 percent, non-condensing. No special dust, static electricity control, or chilled water facilities are available. The computer is integrated with the air conditioning system to provide automatic thermal shutdown to prevent equipment failure during extreme high or low temperature conditions.

3.1.5.4 Remote Locations. Remote equipment is installed in various office environments within U.S. Air Force organizations. Terminals, office printers, and modems shall fit on normal table tops or desk surfaces.

3.1.5.5 TEMPEST Requirement. All equipments, connectors, and cabling that convey classified information must meet the limits specified in NACSIM 5100A. All equipment must be on the Preferred Products List (PPL) or approved by AFCSC/EPV San Antonio, TX 78243.

3.2 Support Software Environment. AFIRMS software is broken up into two general categories: Applications Software and Support Software. Applications Software is that software which applies specified algorithms to a given data set, and/or stores/retrieves/formats/analyzes/displays a given set of data. Applications software programs/algorithms are enumerated and defined in the AFIRMS Transforms and Models Document. This paragraph describes the support software which interfaces with the wing subsystem applications software to create the environment necessary to support AFIRMS' general functionality and the AFIRMS Applications Software.

3.2.1 Central Node Support Software. Each AFIRMS Central Node requires the support software identified in this section.

3.2.1.1 Operating System. A general purpose operating system provides file access, program control, and data communications interfaces. Operating system operation (e.g., device I/O) must not significantly impact the timing and flexibility of AFIRMS operational software. The operating system must be able to:

- a. Concurrently process a combination of interactive and local batch processing.
- b. Support a multi-programming environment.
- c. Support both file and record level locking protection capabilities.
- d. Provide control over all hardware and software.
- e. Support logical as well as physical mode access to all system peripheral devices including terminals.
- f. Be capable of detecting and marking bad blocks while formatting system and data disks as well as during normal operation.
- g. Support up to 8 concurrent interactive users in a minimum configuration and up to 20 concurrent interactive users in a maximum configuration.
- h. Provide access to a calendar clock which provides the calendar date and time with a resolution of one microsecond (for purposes of statistical performance analysis data collection) showing hours, minutes, and seconds for time; and day, month, and year for date. This calendar clock is accessible to all programming languages.
- i. Detect and terminate attempts to read or write outside of any programs allocated memory and detect and terminate attempts by any applications program to execute privileged and undefined instructions.
- j. Provide high order language (HOL) runtime support for input/output (I/O), scheduling, and interprocess communication and coordination.
- k. Provide memory fault detection and recovery capabilities.
- l. Support high level control of interrupt detection, definition, and processing activities.
- m. Provide the capability to perform dynamic load analysis and reporting.
- n. Provide host language interfaces (system directives) to system functions.

3.2.1.2 Utility Routines. The following utility routines are required:

- a. File Management System
- b. Sort and Merge Utility

- c. Translation Utility (character code conversion, e.g. ASCII to EBCDIC and vice-versa)
- d. Save and Restore Utility (to and from tape)
- e. Security Utility (Error surveillance and alerts; to recognize, record and indicate misuse, and attempted misuse, of the system.)
- f. Logging/Accounting Utility (An automated audit trail will show: access made to files; how, and from where the access was initiated; the identity of the person or process that initiated the access; and all unauthorized attempts.)
- g. Diagnostic Software
- h. Mail Utility

3.2.1.3 Communications Software. The specific requirements for communications software are determined during the Analysis Phase that precedes implementation at each site. However, at a minimum, a host interface to the Defense Data Network (DDN) is required for each AFIRMS site. This interface implements the full DDN protocol suite, and supports site-to-site communications over the DDN. It also provides the standard DDN services of terminal-to-host communications, file transfer, and electronic mail to users of the AFIRMS system. Connection to the DDN is via the ARPANET network access protocols or X.25. Host-to-host communication shall be via the Transmission Control Protocol (TCP), MIL-STD 1778, and Internet Protocol (IP), MIL-STD 1777. The services which are supported are TELNET, File Transfer Protocol (FTP), and the Simple Mail Transfer Protocol (SMTP).

Encryption services provided by the DDN are limited to SECRET security classifications. However, with user acquisition of TOP SECRET security classification encryption devices, the DDN can be accessed for transmission of TOP SECRET information.

3.2.1.4 Database Management System (DBMS). The AFIRMS DBMS performs the action of retrieving a record from a file, writing a record to a file, and deleting and creating records in a file. The DBMS also performs functions such as opening and closing the database, transaction flow, handling of the DBMS command language requests, transaction parsing, and automatic editing on input. In addition, the DBMS allows for host language interfaces; save and restoration of full or partial database images; restart and recovery capability with multi-user and multi-thread concurrency controls; and some level of

distributed or decentralized data management with the appropriate synchronization and concurrency controls. The specific level of data synchronization control and data distribution or decentralization required is determined during the Analysis Phase that precedes implementation of each functional block for each MAJCOM.

For a detailed statement of required AFIRMS DBMS capabilities, refer to the AFIRMS TFW Database Specification.

In addition to the software that comprises the AFIRMS DBMS, a software package provides a shell to the DBMS which accomplishes the following:

- a. Controls entry to and exit from DBMS functions.
- b. Provides a link or connection between the communications software and the DBMS.
- c. Controls data retrieval and data update transactions.
- d. Generates a queue for transactions by transaction priority.
- e. Performs update notifications to other sites for data changes (deletions, additions or modifications) in a DBMS file.
- f. Determines whether data retrieval and update transactions are to be routed to the local (functional area) database or the central database.
- g. Provides a link between parameter screen software and the DBMS in order to verify the validity of parameter selections.

3.2.2 Functional Area Support Software. Each AFIRMS functional area requires the support software specified in this section.

3.2.2.1 Operating System. Functional Area operating system capabilities are identical to those of the Central Node Module, identified in Section 3.2.1.1 of this subsystem specification. However, the following exception applies:

- a. The FA operating system must support at least one interactive user in a minimum configuration and up to 3 concurrent interactive users in a maximum configuration.

3.2.2.2 Utility Routines. FA utility routine requirements are the same as those of the CNM, identified in Section 3.2.1.2 of this subsystem specification.

3.2.2.3 Communications Software. The specific requirements for communications software are determined during the Analysis Phase that precedes implementation at each site. Communications between the CNM and the intelligent FA terminals is accommodated by communications protocol(s) identified or confirmed during the Analysis Phase of each functional block implementation. The volume and frequency of the various information gateways by functional area is presented in the AFIRMS TFW Database Specification and Section 4.3.2 of this subsystem specification.

3.2.2.4 Database Management System (DBMS). Functional Area DBMS and DBMS support capabilities are identical to those of the Central Node Module, identified in Section 3.2.2.1 of this subsystem specification.

3.2.2.5 Display/Graphics Software. AFIRMS display screens are categorized by their method of display; graphic, tabular, integrated graphic and tabular. The tabular screens display the data values listed in table format, i.e., rows and columns. The tabular screens may use color to identify data of like types to help the user assimilate the information. The tabular screens also use colors to highlight a line and/or field as a screen place marker for the user, or to call attention to changes in data currency.

The graphic screens are of three types: bar graph, line graph, and pictorial (i.e., maps). These are output screens only (i.e., they cannot be updated through the display screen). In addition, the bar graph screens have a data value atop each graphed bar that quantifies the analog display.

The display screen generation software uses standard routines to generate these screens. In summary, the generalized routines and particular features are:

- a. Tabular Screen Generator must possess the following characteristics:
 - (1) Right-justified numeric data.
 - (2) Left-justified alphanumeric data.

- (3) Line highlighter that can be turned (i.e., toggled) on or off.
- (4) Field highlighter that can be turned (i.e., toggled) on or off.
- (5) Full screen editor (for extensive data input and editing capability)
- (6) Linkable to a special area on the screen to display remarks for a row of data (e.g., Unit and Base Status products). This requires that the display routine know where the cursor is by page and by row in order to call up the correct set of remarks/data.
- (7) Variable legend, either data-driven or user-defined.
- (8) Blanking of repeating column data (selectable).
- (9) Capability to identify (e.g., via blinking, changed color, etc.) a row or column of data that has changed from an original or previous data set. The means by which this "data change indicator" is activated is determined during the Analysis Phase that precedes implementation of particular functions which require this capability.
- (10) Field and row coloring depending on value of data field (selectable).
- (11) Column headings programmable separately from body of table.
- (12) Non-sequential vertical paging (up/reverse, down/forward) as well as horizontal paging and/or segmentation (i.e., virtual screen) capability.
- (13) Scrolling (up, down, left, right) to augment the paging feature.
- (14) Capability to generate a hard copy from a screen display.
- (15) Data error checking and validation capabilities to include checking of input data for legal values, length and format, as well as upper and lower case and special character recognition.
- (16) Grid generation capability.
- (17) Title, subtitle, and heading generation capability.
- (18) Horizontal/vertical field count/sum feature.

b. The Graphic Screen Generator must possess the following characteristics;

- (1) Line Graph and Bar Graph Generators share some common capabilities:
 - (a) Variable legends, either data-driven or user-defined.
 - (b) Automatic x- and y-axis scaling.
 - (c) Y-axis rescaling after screen display initiated by a function key.

- (d) Capability to identify (e.g., via blinking, changed color, etc.) data that has changed from an original or previous data set. The means by which this "data change indicator" is activated is determined during the Analysis Phase that precedes each functional block implementation.
 - (e) Field coloring depending on value of data field (selectable).
 - (f) Capability to generate a hard copy from a screen display.
- (2) Map Maker capabilities:
- (a) Linkable to a special area on the screen to display remarks or other data relevant to the display. This requires the routine to know where the cursor is on the display in order to call up the correct information.
 - (b) A coordinate system so Air Bases or other items of interest can be inserted, labeled and deleted by a nontechnical user using latitude and longitude or Geographic Reference (GEOREF) map coordinates (the positioning will be reasonably accurate with relation to one another).
 - (c) Coloring of the base position according to the dynamic values of a set of database variables (the color indicates a condition or status).
 - (d) A change indicator for positions whose status or condition values were changed.
 - (e) Continuously variable software zoom (if not a hardware capability).
 - (f) The capability to generate and display special symbols.
 - (g) Capability to generate a hard copy from a screen display.
- c. Display Screen Parameter Software must possess the following characteristics:
- (1) The parameter software interacts with the AFIRMS database when necessary, to determine, generate, and list the appropriate parameter choices for the database set requested. For example, if ATO 3 (the specified database set) does not have CBU-52 munitions (a parameter selection) tasked, then the list of choices for a munition type (the parameter) will not include CBU-52.
 - (2) The parameter software is interpretive in nature so as to:
 - (a) Ensure a consistent and well-defined interface to the database transaction software.
 - (b) Provide a flexible and user-friendly mechanism for user selection of alternative data sets.
 - (c) Allow the user to enter synonymous parameter selections; e.g. "YES", "YE", "Y", "OK" can all be entered (and subsequently interpreted by the system) as an affirmative, instead of forcing the user to precisely reflect database values.

- (3) The parameter software also permits write-in choices where appropriate. In some instances it is not possible or practical to list all appropriate parameter selections.
- d. **Function Keys.** AFIRMS is operated utilizing a system of menus and special function keys. Some of the product screen function keys can be seen at the bottom of the display screens described in the AFIRMS Product Description annexes. As the number of available function keys is less than the number of required keys, arrays of keys are utilized to overcome that problem.

The first array contains the basic key functions needed for every display screen. Except for the Base Status Map, the graphic displays require only the first array. The tabular input screens require key functions to add, delete, and change/edit data. A paging and/or scrolling capability is required. Some records have sub-records (e.g., a wing with several munitions as in the Wing Resource Summary Product, a mission with two Aircraft Mission Design Series and/or aircraft Standard Conventional Loads as in the Tasking Information products). Therefore, the second array is reserved for editing records, and the third array is reserved for editing sub-records. Switching between arrays is done with two special function keys. An arrow on either or both ends of the function key array shows the user which array is in use. The required functions of these function keys are outlined in Table 3-1.

3.2.2.6 User Interface Software. The primary functions of this software subsystem are as follows:

- a. It provides the AFIRMS user's sole view of the AFIRMS system.
- b. It serves as the link by which the AFIRMS user's requests are translated into internally recognized system functions, validated, and subsequently performed by the system.

The software providing user interface to the AFIRMS system possesses the following characteristics:

- a. Menu driven with a command language available to provide software capabilities for experienced users.
- b. Consistent menu displays and underlying definitions.
- c. User-friendly.
- d. Fault-tolerant.
- e. Menu paging or scrolling.
- f. Help available at all levels of user/system interaction.
- g. Allows for multiple access paths to all user functions (via functional area workstation groupings, alphabetical lists, logically related system functions, etc.)

- h. Provides functionality to accept specified user parameters which limit information returned for screen data retrieval requests.
- i. Provides functionality to allow interactive "through the display screen" updates to the AFIRMS database (as discussed in section 3.2.2.5 of this subsystem specification).
- j. Detects and automatically logs off terminals which have been inactive for an operator definable period of time. This time is determined and set by the system operator.

Table 3-1

PRODUCT DISPLAY SCREEN FUNCTION KEY DESCRIPTION

Key Label	Function Description
1st Array:	
DISPLAY PARAM SELECT	Takes the user back to the parameter selection screen. The parameter choices the user made to display the product are redisplayed.
LINE HIGHLIGHT TOGGLE	Changes the state of the Line Highlighter toggle. If it is turned/toggled OFF, the state is changed to ON and the Line Highlighter appears. If it is toggled ON, the state is changed to OFF and the Line Highlighter is removed from the tabular display. The function key is not active when a graphic screen is displayed.
HARD COPY	Spawns a batch process to print a color copy of the display. This key is on the 1st array only if the product has a single screen display. For multiscreen displays, the key is on the 2nd array with the paging keys.
TOP MENU	Returns the user to the first/top menu.
PREVIOUS MENU	Returns the user to the menu from which the product was selected.
HELP	Interrupts the product display and takes the user to the HELP system. When finished with the HELP screen, the user returns to this display.
UPDATE SCREEN	Causes the system to refresh or update the product display using the current parameter choices. Normally used with a resource status product when the system notifies the user that the status data has been updated.
2nd Array:	
PAGE REVERSE	Page the product in reverse order. It pages a full or half page at a time, depending on the paging option selected. It is active only when a tabular product is displayed and is longer than one page of display.
FULL PG HALF PG	Changes the paging state to FULL or HALF paging, depending on the current state. The current paging state is always highlighted or colored.
PAGE FORWARD	Causes the system to page the product forward in sequential order. It pages a full or half page at a time, depending on the paging option selected. It is active only as described in PAGE REVERSE above.
CHANGE XXXXXX DATA	Permits editing of the screen data. The 'XXXXXX' is changed to the appropriate term (such as aircraft or aircrew) when the product is designed. Used only for tabular products. Pressing the function key a second time de-activates the CHANGE mode.
ADD XXXXXX DATA	Permits the addition of a record to the database. Used only for tabular products. Pressing the function key a second time de-activates the ADD mode.

Table 3-1 (Continued)

PRODUCT DISPLAY SCREEN FUNCTION KEY DESCRIPTION (Continued)

Key Label	Function Description
DELETE XXXXXX DATA	Permits the deletion of a record from the database. Used only for tabular products. Pressing the function key a second time de-activates the DELETE mode.
ENTER	Updates the data base as directed by the three previous keys (CHANGE, ADD, and DELETE XXXXXX DATA). The ENTER key acts as a confirmation step for the CHANGE/ADD/DELETE keys.
INTERROGATE BASE	Interrogates the cursor position and displays a box containing data corresponding to the base displayed under the cursor (see Base Status Map).
DELETE DATA BOX	Deletes the box containing the base data.
SCALE UP	Increases the y-axis scale of the bar graph by approximately 100% after the screen is displayed. Used with bar graphs only.
SCALE DOWN	Decreases the y-axis scale of the bar graph by approximately 50% after the screen is displayed. Used with bar graphs only.
3rd Array: PAGE REVERSE	Page the product in reverse order. It pages a full or half page at a time, depending on the paging option selected. It is active only when a tabular product is displayed and is longer than one page of display.
FULL PG HALF PG PAGE FORWARD	Changes the paging state to FULL or HALF paging, depending on the current state. The current paging state is always highlighted or colored. Causes the system to page the product forward in sequential order. It pages a full or half page at a time, depending on the paging option selected. It is active only as described in PAGE REVERSE above.
CHANGE XXXXXX DATA	Same as CHANGE XXXXXX DATA key above except only sub-record data is changed. The system prevents changes to record keys/data.
ADD XXXXXX DATA	Same as ADD XXXXXX DATA key above except able to add sub-records only.
DELETE XXXXXX DATA	Same as DELETE XXXXXX DATA key above except able to delete sub-records only.
ENTER	Updates the data base as directed by the three previous keys (CHANGE, ADD, and DELETE XXXXXX DATA). The ENTER key acts as a confirmation step for the CHANGE/ADD/DELETE keys.

3.3 Interfaces. AFIRMS avoids data redundancy when possible; however, some redundancy is required for deployment and response time requirements. AFIRMS, where possible, also maximizes the use of USAF (and other suitable DoD Automated Data Processing Systems (ADPSs)) to provide AFIRMS information. This paragraph describes the wing subsystem intrasite interfaces as well as interfaces to the MAJCOM subsystem. Interfaces to external (e.g., USAF, DoD) automated systems are discussed in the AFIRMS System Specification.

The wing subsystem interfaces with the MAJCOM subsystem through computer-to-computer network software products. These products link various operating systems and provide the functionality required to effect information flows between AFIRMS subsystems.

As AFIRMS intends to host on existing hardware and equipments as much as possible, the specific protocols to be used are largely dependent upon existing and/or planned Air Force ADPSs. Thus, they are determined or confirmed during the Analysis Phase that precedes implementation of each functional block.

AFIRMS is developed to take advantage of currently existing systems that already provide accurate data collection. It is also designed to take advantage of systems that produce capability assessments using a subset of the resources AFIRMS ultimately uses to produce its capability assessments. In order to handle interfaces with future developing systems, AFIRMS is designed modularly with generic data gateway interfaces. As these new systems are implemented, they can easily be interfaced with AFIRMS. These generic interfaces apply to communications networks as well as data systems.

AFIRMS is data collection intensive. However, AFIRMS attempts to minimize duplication of the collection of any data that is already being collected by another system (e.g., munitions data collected by Combat Ammunition System (CAS)). In addition, AFIRMS does not compute an assessment that is already available in another system (e.g., spares analysis computed by Combat Supplies Management System (CSMS)).

3.3.1 AFIRMS Intrasite Interfaces. The transactions that occur within a particular AFIRMS site require three types of interface specifications:

- a. **Intrasite Transaction Header.** This interface specification defines the format of the information required to transmit any transaction to/from the CNM from/to any functional area workstation.

Appendix A provides the detailed specification of the information contained in this header interface.

- b. Display Screen Interfaces. These interface specifications define the format of the data that is retrieved on behalf of the functional user in accordance with his/her input parameters and subsequently transmitted to the functional area. Each of these interface specifications also requires an Intrasite Transaction Header as defined above.

Table 3-2 provides a cross-reference between the AFIRMS output reports set forth in Section 4.3.2 of this subsystem specification and the AFIRMS internal interface specifications provided in Appendix B.

- c. Data Update and Retrieval Transaction Interfaces.

The logical data flow for data update and retrieval transactions is provided in Tables 3-3 and 3-4 respectively.

Tables 3-5 and 3-6 provide the interface specifications for the data update and data retrieval requests, respectively. Each of these requests also requires an Intrasite Transaction header as defined above.

Table 3-2

AFIRMS OUTPUT REPORT
(Cross-Reference to Appendix B)

Screen Title	Interface Spec. Appendix Cross-Reference
AGE Availability Status	APIB/S
AGE Support Capability	APIB/S
Aircraft & Mission Tasking Details	APIB/S
Aircraft Availability	B-6
Aircraft Capability	B-6
Aircraft Spares Support Capability	APIB/S
Aircraft Status	B-1
Aircraft Tasking	B-2
Aircrew Availability	B-1
Aircrew Capability	B-6
Aircrew Generation	B-5
Aircrew Status	B-1
Airfield Status	APIB/S
Base Fuels Capability	B-2
Base Status (Input)	B-1
Base Status (Output)	B-1
Flying Schedule (Maintenance)	B-1
Flying Schedule (Operations)	B-1
Fuels Capability	APIB/S
Fuels Status	B-1
Fuels Status Map	APIB/S
Individual Resource Capability	B-2
Integrated Capability	B-2
Maintenance Support Capability	APIB/S
Mass Load Generation Schedule	APIB/S
Mission Flow	APIB/S
Mission Profile Definition	B-1
Munition Flow	APIB/S
Munitions A & D Availability	APIB/S
Munitions Assembly Capability	APIB/S
Munitions Availability Forecast	B-4
Munitions Capability	B-2
Munitions Distribution Capability	APIB/S
Munitions Load Capability	APIB/S
Munitions Load Crew Available	APIB/S
Munitions Load Crew Flow	APIB/S
Munitions Status	B-1
OPlan/OPORD Associations	B-1
Order Assignments	B-1
Process Status	B-1

* APIB/S - Analysis Phase Initial Block for each Segment

Table 3-2 (Continued)

AFIRMS OUTPUT REPORT
(Cross-Reference to Appendix B)

Screen Title	Interface Spec. Appendix Cross-Reference
Refueling Capability	APIB/S
Refueling Truck Flow	APIB/S
Single Aircraft Summary	APIB/S
Supply MICAP Status	B-1
Task Capability	APIB/S
Tasked Missions	B-6
Tasked Munitions	B-6
Tasking Information	B-1
Unit Status (Output)	B-1
War Mobilization Plan	B-1
Wing Flying Day	B-1
Wing Operations Rates	B-1
Wing Resource Summary	B-1
Wing Resupply Schedule	B-1

* APIB/S - Analysis Phase Initial Block for each Segment

TABLE 3-3a
DESCRIPTION OF DATA FLOW
FOR
DATA RETRIEVAL TRANSACTIONS
(Functional Area Workstation)

User logs onto FAW by entering username and password.

If username/password combination is invalid, then

The FAW keeps track of the number of consecutive times this occurs, as well as the invalid information.

If invalid information has been entered three times in a row, then

FAW logically locks the terminal from further use by saving the information on the disk and indicating that state.

FAW generates a siren-like sound indicating the security violation.

FAW displays the security violation screen.

FAW sends to the ACNM (if possible) a security message indicating the problem.

The ACNM notifies the security officer via three ways:

(1) Sends a message directly to his/her terminal if he/she is logged on.

(2) Sends a security message to his/her mailbox.

(3) Sends the security message to the system manager's hardcopy device.

Else

FAW gives user another chance to logon properly.

Endif

Else [valid user logon has occurred on the FAW]

FAW attempts to logon to the ACNM by passing the username/password entered.

The ACNM performs security checks.

If a security violation has been detected, then

ACNM logically locks the terminal port from further use by saving information on the disk and indicating that state.

The ACNM notifies the security officer via three ways:

(1) Sends a message directly to his/her terminal if he/she is logged on.

(2) Sends a security message to his/her mailbox.

(3) Sends the security message to the system manager's hardcopy device.

The ACNM tells the FAW of the security violation.

Else [valid user logon has occurred on the ACNM]

AFIRMS processes are started that run on the user's behalf.

If there is no problem starting these processes, then

AFIRMS code and data needed for the user are downloaded.

If all necessary data and code reach the FAW successfully, then

The ACNM gets ready for requests from the FAW on behalf of the user.

The ACNM tells the FAW that fact.

Else

There is a problem.

Endif

Endif

TABLE 3-3a
DESCRIPTION OF DATA FLOW
FOR
DATA RETRIEVAL TRANSACTIONS
(Functional Area Workstation) (Continued)

```

    If there is a problem on the ACNM, then
        The ACNM informs the FAW of the problem.
        The ACNM logs the user off AFIRMS.
        The FAW notifies the user of the problem.

    If a local database for this user exists from a previous logon, then
        the user is allowed to make requests of his/her local database only.
    Else
        The FAW notifies the user of the problem.
        The FAW logs the user off AFIRMS.
    Endif
Endif
Endif
Endif

[CNM checks for data stored on behalf of the user on non-volatile random access medium.]
If ACNM finds data destined for the user, then
    ACNM sends FAW user data summary.
Endif

ACNM sends FAW the currently available CPU/processing power for each CNM.
FAW notifies user of data stored on his/her behalf (e.g., previous request, mail).
If user chooses details of his/her CNM data, then
    FAW displays user data summary.
    [User selects which data he/she wishes to view/delete.]
Endif

    If user wishes to view/delete a dataset, then
        If ACNM can be talked to via normal communications link or dial-up, then
            The view/delete request is transmitted to the ACNM.
        Else
            The user is notified that there is a problem.
            The user is asked to make another request.
        Endif
    Endif
Endif

```

TABLE 3-3a
DESCRIPTION OF DATA FLOW
FOR
DATA RETRIEVAL TRANSACTIONS
(Functional Area Workstation) (Continued)

```

FAW user requests screen for viewing via FAW MMI.
[FAW database is checked for required data.]
If all data exists (is resident) locally, then
    FAW software determines if the response time would be faster by allowing a CNM to
    perform the request.

    If processing is faster on the CNM, then
        The request is transmitted to the ACNM.
    Else [processing is faster locally]
        The FAW handles the request locally.
    Endif

Else [some or all of the data exists elsewhere]
    The user is informed that his/her request requires access to the CNM's database.
    The user is asked for confirmation of the request.

    If the user confirms the request, then
        If the ACNM can be talked to via normal link or dial-up, then
            The request is transmitted to the ACNM.
        Else
            The user is notified there is a problem.
            The user is requested to make another screen selection.
        Endif
    Else [the user didn't confirm the request]
        The user is requested to make another screen selection.
    Endif
Endif

```

Acronym Definitions

ACNM - the CNM directly attached to the user's FAW
 AFAW - all functional area workstations attached to an ACNM
 CNM - central node module/manager
 FAW - functional area workstation
 MMI - man-machine interface
 NCNM - CNM that the user is newly attached to (assuming he logged off while his request was being processed)
 NFAW - newly logged-onto FAW
 OCNM - original CNM that received a FAW request
 OFAW - original FAW that made a request
 PCNM - the CNM that actually performed the FAW request

TABLE 3-3b

DESCRIPTION OF DATA FLOW
FOR
DATA RETRIEVAL TRANSACTIONS
(Central Node Manager)

```

The ACNM receives a FAW request for data retrieval.
[The OCNM determines which CNM can best process the request.]
If the request should be handled by a "different" CNM, then
    The request is transmitted to the CNM that can best handle it.
Endif

If there are requests currently queued, then
[A separate queue is maintained for updates. It is always serviced before the query queue
in order to minimize database conflicts.]
    The request is queued according to priority using a FIFO algorithm.
    As requests are completed, the next request performed is the one at the top of the
    highest priority queue with a request currently queued.

Else [there are no other requests queued]
    The request is performed immediately.
    The PCNM transmits to each AFAW and all other CNMs its currently available
    (unused) CPU/processing power.
Endif

The CNM that processes the request transmits to each attached FA and all other CNMs
its currently available processing power. Each of the "other" CNMs also transmits this
processing capability to its FAWs.
[When an interactive request is completed, the results are sent back to the requesting
user.]

If the request was handled by other than the OCNM, then

    [First a check is made to see if the user is still logged onto any of the
    OCNM's FAWs.]
    If the PCNM can talk to the OCNM, then
        The PCNM sends a "check if the user is still logged on" request to the OCNM.
        The OCNM sends a response to the PCNM.

        If the user is still logged onto the OCNM, then
            The PCNM transmits the results to the OCNM.

        Elseif the user is logged onto any of the PCNM's FAWs, then
            The PCNM transmits the results to the user's NFAW.
    
```


TABLE 3-3b
DESCRIPTION OF DATA FLOW
FOR
DATA RETRIEVAL TRANSACTIONS
(Central Node Manager) (Continued)

Elseif the PCNM can talk to the other CNMs, then
The PCNM sends a "check if user is still logged on" request to each of the other CNMs in sequence to determine if the user is logged onto any other CNM's FAWs.

If the user is not logged onto the system, then
The PCNM transmits the results to the OCNM.
The OCNM saves the results on a non-volatile, random access medium for later use.

Else
The PCNM transmits an "asynchronous event" message to the CNM which is attached to the NFAW the user is logged onto.
That CNM then transmits the message to the user's NFAW.
Endif

Else [the communications links between the CNMs not working]
The PCNM saves the results on non-volatile, random access medium for later use.
Endif

Else [communications link between the PCNM and the OCNM not working]
If the user is logged onto any of the PCNM's FAWs, then
The PCNM transmits the results to the user's NFAW.

Else
The PCNM saves the results on non-volatile, random access medium for later use.
Endif

Endif

If the user is logged onto any FAWs when his/her request completes, then
The ACNM transmits the results to the user's FAW regardless of whether the user is logged onto the OFAW from which the request was made, or a NFAW.
Endif

The PCNM must transmit to each attached FA and all other CNMs its available CPU/processing capability. This capability is used by:
(1) The FAWs to determine if a CNM can handle a request faster, and
(2) The CNMs to determine which CNM can handle a request faster.

Acronym Definitions

ACNM - the CNM directly attached to the user's FAW
FAFW - all functional area workstations attached to an ACNM
CNM - central node module/manager

TABLE 3-3b
DESCRIPTION OF DATA FLOW
FOR
DATA RETRIEVAL TRANSACTIONS
(Central Node Manager) (Continued)

FAW	- functional area workstation
MMI	- man-machine interface
NCNM	- CNM that the user is newly attached to (assuming he logged off while his request was being processed)
NFAW	- newly logged-onto FAW
OCNM	- original CNM that received a FAW request
OFAW	- original FAW that made a request
PCNM	- the CNM that actually performed the FAW request

TABLE 3-4a
DESCRIPTION OF DATA FLOW
FOR
DATA UPDATE TRANSACTIONS
(Functional Area Workstation)

After reviewing the retrieved data, the user updates a record.
The editor does not allow the user to change any field that he/she does not have privilege for.
The OFAW sends the updated record (including its keys) to the ACNM.
The OFAW also updates its local database. A copy of the "before" and "after" database record images is saved in case the update must be backed out.

[Note: The user is not prevented from making further requests of AFIRMS at this point. All messages from the ACNM occur asynchronously. The user is notified each time asynchronous messages occur. At that point, he/she can request a display containing a list of all asynchronous events pertaining to him/her. This display is a temporary "window" which is used only for viewing any asynchronous events. It cannot be used for any screen which can be requested via the normal screen selection list. This window can also be looked at via the normal screen selection list. Viewing of this screen does not in any way destroy the state of the screen the user was viewing prior to looking at the window. That is, after the user has completed viewing the window, the next screen seen is the one the user was viewing at the time he/she requested to look at the window, restored to its original state.]

For all other FAWs receiving the changed information from their ACNM,
The local database is updated with the changed information.

If the user is currently looking at the changed information, then
The FAW indicates to the user that a change has occurred.
The user can then look at the screen via a window that contains all asynchronous events, if desired.

Endif

Endfor

If the OFAW receives a security violation message from the ACNM, then
The OFAW logically locks the terminal from further use by saving the information on the disk and indicating that state.
The OFAW generates a siren-like sound indicating the security violation.
The OFAW displays the security violation screen.
The OFAW backs out the update that was attempted.
The OFAW deletes the "before" and "after" database record images.

Elseif the OFAW cannot send a message to its ACNM because of communications problems, then

The OFAW backs out the update that was made previously.
The OFAW deletes the "before" and "after" database record images.
The OFAW allows the user to continue making other requests.

Elseif the OFAW receives a processing error message from the ACNM, then
The ACNM saves the update information on non-volatile random access medium for later use in attempting to update the central database.
The OFAW deletes the before and after database record images.

Endif

TABLE 3-4a
DESCRIPTION OF DATA FLOW
FOR
DATA UPDATE TRANSACTIONS
(Functional Area Workstation)

Acronym Definitions

- ACNM - the CNM directly attached to the user's FAW
- AFAW - all functional area workstations attached to an ACNM
- CNM - central node module/manager
- FAW - functional area workstation
- MMI - man-machine interface
- NCNM - NM that the user is newly attached to (assuming he logged off while his request was being processed)
- NFAW - newly logged-onto FAW
- OCNM - original CNM that received a FAW request
- OFAW - original FAW that made a request
- PCNM - the CNM that actually performed the FAW request

TABLE 3-4b
DESCRIPTION OF DATA FLOW
FOR
DATA UPDATE TRANSACTIONS
(Central Node Manager)

```
The ACNM receives an OFAW update request.
[The OCNM determines whether the update request should be processed immediately
or not.]
If there are other update requests in the update queue, then
    The update request is queued at the end of the update queue.
    As update requests are completed, the request that is at the top of the update queue
    is performed.
Endif

[The OCNM performs a security check to make sure the user is allowed to make the
update to the database.]
If the user is not allowed to make the update [a security violation has occurred] then
    The OCNM informs the FAW of the problem.
    The OCNM notifies the security officer via three ways:
    (1) Sends a message directly to his/her terminal if he/she is logged on.
    (2) Sends a security message to his/her mailbox.
    (3) Sends the security message to the system manager's hardcopy device.
Else [the user is allowed to make the update]
    The OCNM attempts to update the central database.
    If the user making the update request is still logged onto the OFAW, then
        The OCNM sends the update status back to the OFAW.
    Else
        The OCNM saves the update status on non-volatile random access medium for
        later use.
    Endif

[The OCNM determines whether other CNMs need that update information.]
If other CNMs need the update information, then
    It is sent to them. In addition to the changed information, the time/date of the
    update, as well as the username of the person that made the change, are sent.
Endif

All CNMs that receive updated information must send those changes to each of their
FAWs that currently have a local database containing that record.
[Data consistency checks are made.]
If other data within the central database is inconsistent with the newly updated
information, then
    That data is made consistent by:
    (1) intelligent software, or
    (2) requesting the user to make other information consistent; otherwise the original
        change is backed out and all FAWs originally receiving that change are notified.
Endif
Endif
```

TABLE 3-4b

DESCRIPTION OF DATA FLOW
FOR
DATA UPDATE TRANSACTIONS
(Central Node Manager) (Continued)

Acronym Definitions

- ACNM - the CNM directly attached to the user's FAW
- AFAW - all functional area workstations attached to an ACNM
- CNM - central node module/manager
- FAW - functional area workstation
- MMI - man-machine interface
- NCNM - NM that the user is newly attached to (assuming he logged off while his request was being processed)
- NFAW - newly logged-onto FAW
- OCNM - original CNM that received a FAW request
- OFAW - original FAW that made a request
- PCNM - the CNM that actually performed the FAW request

Table 3-5

CNM DATA RETRIEVAL REQUEST INTERFACE SPECIFICATION

CNM Data Retrieval Request
Interface Specification

Date: 31-May-1985

The CNM Data Retrieval Request buffer layout is as follows

Screen # requested	# of parameters to follow
-----------------------	------------------------------

Repeats # of parameters to follow times

Parameter number	Parameter selection number	Length of parameter value	Parameter value
---------------------	----------------------------------	---------------------------------	--------------------

Field NameField Length

Screen number requested
Number of parameters to follow
Parameter number
Parameter selection number
Length of parameter value
Parameter value

3
2
2
2
3
?

Note: Each field whose length is "?", represents a variable length field. Only these fields are preceded by a 2-byte length descriptor field.

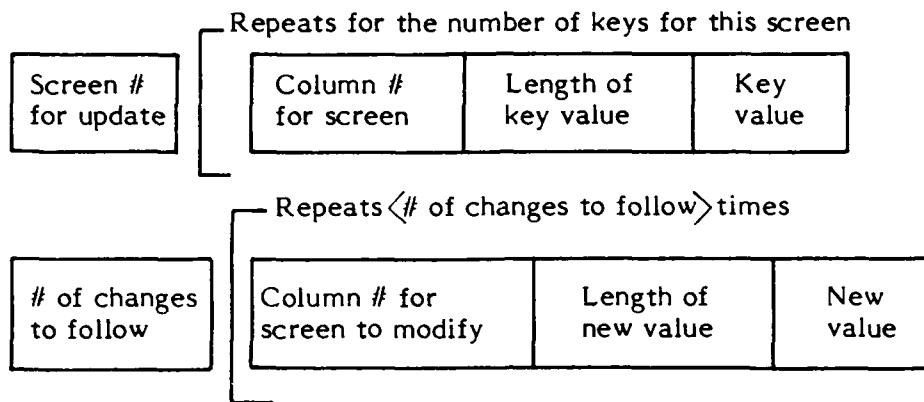
Table 3-6

CNM DATA UPDATE REQUEST INTERFACE SPECIFICATION

CNM Update Request Interface Specification

Date: 31-May-1985

The CNM Update Request buffer layout is as follows:



<u>Field Name</u>	<u>Field Length</u>
Screen # for update	3
Column # for screen	2
Length of key value	2
Key value	?
# of changes to follow	3
Column # for screen to modify	2
Length of new value	2
New value	?

Note: Each field whose length is "?", represents a variable length field. Only these fields are preceded by a 2-byte length descriptor field.

3.4 Security. THE AFIRMS ADPS processes noncritical-sensitive data as defined in Attachment 6 to AFR 205-16. The operational AFIRMS system handles users and data at classification levels from Unclassified to Secret. There are Top Secret AFIRMS-related data at the wing level. However, due to limitations of controlled mode operations, AFIRMS does not initially handle Top Secret data. AFIRMS capability assessments involving Top Secret data are accomplished manually. When multilevel security procedures are available, the controlled mode security limitations can be reevaluated during the analysis phases of each implementation block. More specifically, wing sites have personnel with a need-to-know of Unclassified through Secret. Some wing personnel have need to input or access unclassified data resident at wing user terminals. Thus, an operational AFIRMS wing site must handle simultaneously a mix of user data, and user terminal security classifications. Therefore, sites at the wing level operate in the Controlled Security Mode. This is accomplished by utilizing a combination of the following security measures:

- a. **Personnel Security.** All personnel having access to MAJCOM and HQ USAF AFIRMS facilities and/or data have a security clearance equal to the highest level of classification being processed, stored, or displayed. At all AFIRMS sites, each user's identity is positively established via user IDs and log-on passwords (terminal display of which is suppressed), which are used to authenticate/verify AFIRMS users' identities and their corresponding access privileges. AFIRMS provides a capability to prevent unauthorized users from executing a protected program or series of programs.

A personnel security program is implemented for the AFIRMS program in accordance with the provisions of DoD Regulation 5200.2/AFR 205-32 USAF Personnel Security Program. Personnel access controls are implemented for the AFIRMS central computer facilities and remote terminal areas.

- (1) **Central Computer Facility.** Strict personnel access controls are implemented to ensure that the only personnel admitted are those who require access to the central computer facility, and possess a security clearance at least equal to the highest classification of information being processed or openly stored at the facility.
- (2) **Remote Terminal Area(s).** Authorization for access to and the use of remote terminal devices is based on an individual's duties, his/her need to use the terminal, and possession of a security clearance of the required level.
- b. **Physical Security.** Measures must be taken to ensure external protection for AFIRMS against unauthorized access to the central computer facility, to the system from remote terminals, and to data storage media.
 - (1) **Central Computer Facility.** Central computer facility physical security must meet the requirements established for the highest classification and all sensitivity categories of data that are either resident in the ADPS or openly stored.

- (2) Remote Terminal Area(s). Physical security measures at remote sites must fulfill the minimum requirements for the highest classification of information accessed from or stored at the site.
- c. Hardware Security. AFIRMS system hardware meets all of the provisions recommended in DoD 5200.28M, ADP Security Manual for hardware security features.
- d. Software Security. The operating systems selected for use meet the general software security requirements stated in DoD 5200.28M. In addition to the security protection features contained in the operating systems, a combination of system and application software protection features are utilized to provide the following security protection to comply with applicable DoD and Air Force security policies.
 - (1) Access Control to prevent unauthorized entry to systems, files and programs. Wings cannot query HQ USAFE (MAJCOM-level) data. Information flow will be one-way (upwards) from wings to HQ USAFE in order to maintain (at HQ USAFE) access control of Top Secret data.
 - (2) File Security to prevent unauthorized access or alterations to files.
 - (3) Error Surveillance and Alerts to recognize, record and indicate misuse of the system.
 - (4) File Security to prevent unauthorized access or alterations to files. An automated audit trail will show: access made to files; how, and from where the access was initiated; the identity of the person or process that initiated the access; and all unauthorized attempts.
 - (5) User Monitoring and Isolation to ensure the user has access to only the system information to which he is entitled.
- e. System Stability. All AFIRMS components operate so that one can automatically or administratively detect and report system hardware and software malfunctions in time to prevent unauthorized disclosure.
- f. Data Integrity. Each database, file, and data set/element is identified with an origin, use, and an explicitly defined set of access controls. These access controls are based on classification, sensitivity, user clearance, and established need-to-know.
- g. National Bureau of Standards (NBS) or National Security Agency (NSA) approved data encryption devices may be required for transmission of sensitive unclassified data depending on the nature of the data.
- h. Emanations Security (EMSEC). ADP and communications equipment utilized to process classified material at AFIRMS sites will be TEMPEST approved. All devices that are not TEMPEST approved will be tested and approved for placement in the ADP facilities in such a manner as to control compromising emanations. All equipment will be installed IAW the guidelines stated in NACSIM 5203.

- i. **Procedural Security.** Security operating procedures will meet the requirements of AFR 205-1 and 205-16 and include the following:
 - (1) System Access Controls
 - (2) File Access Controls
 - (3) Personnel Access Controls
 - (4) Security Markings
 - (5) Protecting Classified Output
 - (6) Physical Security
 - (7) Protection of Residual Information
 - (8) Declassification Guidelines

3.5 Controls. The AFIRMS Wing subsystem requires integrated control functions which operate at system levels independent of stated AFIRMS operational functionality. These functions are implemented and utilized so as to minimize their impact on AFIRMS execution.

Control functions are logically separated into two functional categories; System/Operations Management Controls, and Intrasite Access and Data Flow Controls.

3.5.1 System/Operations Management Controls. These controls incorporate the following functions:

- a. The application of software monitoring and diagnostic utilities.
- b. The application of hardware monitoring and diagnostic utilities.
- c. The ability to start, stop, and restart AFIRMS system and communications processes, including upper-level control of network performance.
- d. The ability to alter AFIRMS subsystem runtime parameters dynamically (e.g., process priorities, operating system parameters, etc.)

3.5.2 Intrasite Access and Data Flow Controls. These functions address control requirements imposed by security and data integrity issues. They also assist in supporting downgraded operational modes. These functions include:

- a. Dynamic imposition of limitations/new priorities on intrasite data communications to and/or from specific functional areas.
- b. Dynamic limitations/alterations of data access and/or data modification authorizations for specific functional areas.

SECTION 4. DESIGN DETAILS

4.1 General Operating Procedures. After AFIRMS is installed, user/operator manuals guide system operation. The user/operator manuals contain instructions on how to turn equipment on and off, as well as clear, concise instructions for the operation of AFIRMS. Operating procedures for both the system software, hardware, and functional products are provided as a combination of vendor-provided documents and AFIRMS user manuals. The vendor-supplied documents detail hardware and system software procedures while AFIRMS user manuals detail functional product procedures including communications and security. The manuals are written in sufficient detail to enable the system user to respond to most situations he/she may encounter. The specific requirements for AFIRMS user/operator manuals are determined during the in-depth analysis that precedes implementation at each AFIRMS site.

4.1.1 System Start, Restart, and Stop Times. Maximum system start, restart, and stop times are provided below. AFIRMS hardware must accommodate these times. All specified times are non-data communications related; i.e., they do not include the amount of time that may be required to transfer additional required data from the CN to the FA upon system startup. Data communications times are dependent upon the data distributions at each AFIRMS site. These times presume a booted and ready Central Processing Unit (CPU); that is to say, times exclude host machine power up and initial bootstrap.

	<u>Central Node</u>	<u>Functional Area</u>
System Start	30 seconds	30 seconds
System Restart*	60 seconds	120 seconds
System Stop (Down)	60 seconds	120 seconds

* Precise definition and features of the System Restart shall be reviewed and determined during the analysis phase that precedes implementation at each site.

4.2 Wing Subsystem Logical Flow. AFIRMS logical and intrasite information flow is shown in Figures 4-1 and 4-2, respectively. Squadrons are linked hierarchically to a wing which is linked hierarchically to a MAJCOM, which in turn is linked to HQ USAF.

AFIRMS is a "push" system only. This means that there is upward reporting of data at regular intervals, with no provision for ad-hoc querying of databases between sites. The data accessible at AFIRMS sites is at the level of detail appropriate to the particular command level. However, flexibility to increase the frequency of upward reporting cycles is provided for exception reporting on a case-by-case basis. Implementation of this exceptional reporting requirement is procedural in nature, and thus external to AFIRMS.

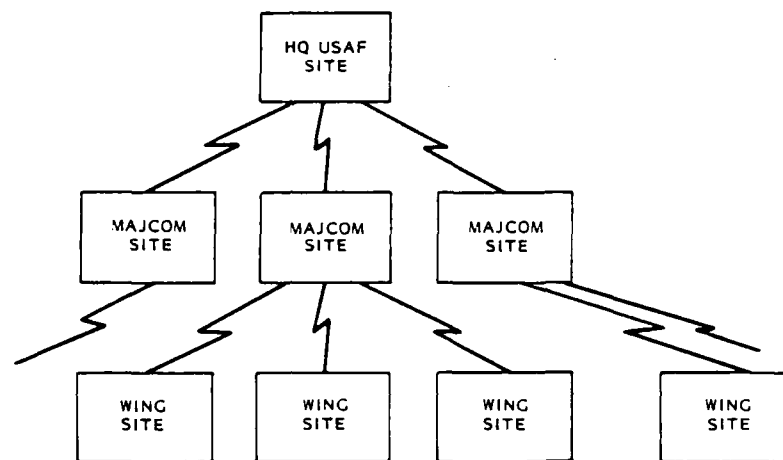


Figure 4-1. AFIRMS Logical Flow

4.3 Subsystem Data. Wing sites operate on the following types of data:

- a. Tasking Data. Tasking data consists of; Designed Operational Capability (DOC) statements, OPlans/OPORDs, special ad hoc taskings from HQ USAFE, and NATO support and tasking requirements from the ATOC.
- b. Resource Data. Resource data is data collected and maintained by the wing squadrons and consists of aircraft status, aircrew status, fuels status, munitions status, and (for later implementation blocks) logistics support status.
- c. Theatre resource data such as depot level fuels and munitions is maintained and provided by depots and support units via automated systems such as CAS, CFMS, etc.

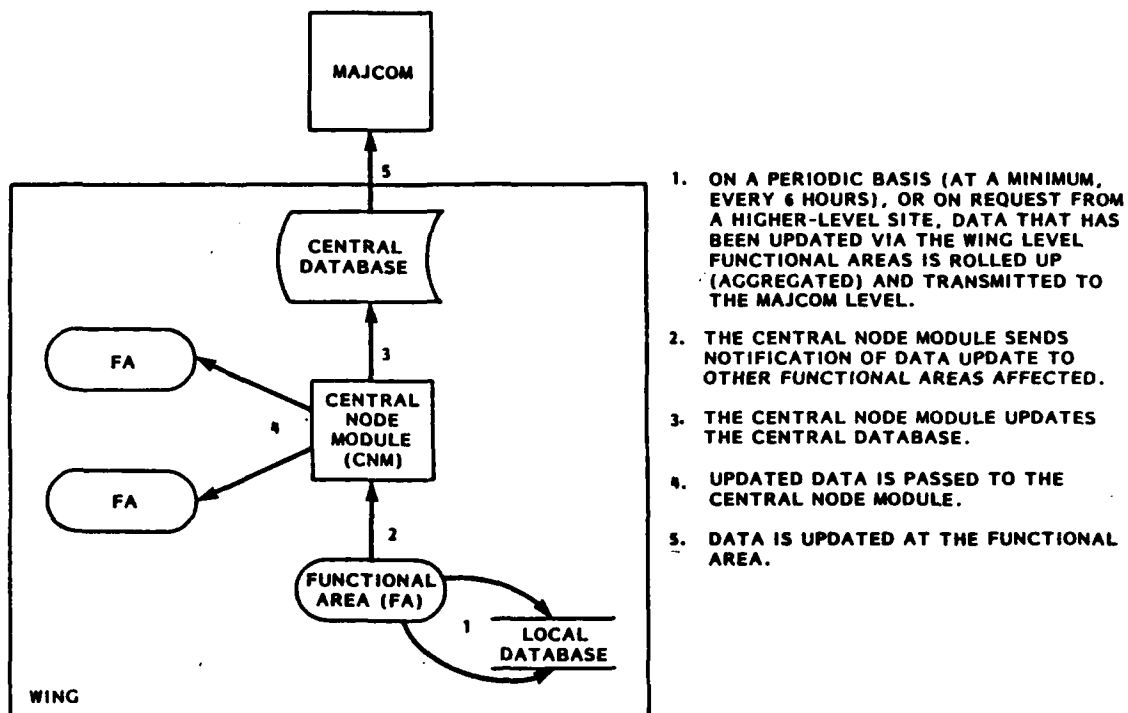


Figure 4-2. AFIRMS Wing Information Flow

4.3.1 Inputs.

a. The following input data is provided to the wing subsystem.

- (1) Tasking Data
- (2) Aircraft Status
- (3) Aircrew Status
- (4) Fuels Status
- (5) Base Status
- (6) Munitions Status
- *(7) Equipment Status
- *(8) Personnel Qualifications
- *(9) Vehicles Status

* For later implementation blocks. (Should be considered for working memory and data storage sizing/expansion purposes.)

- * (10) AGE Status
- * (11) TRAP Status
- * (12) Maintenance Support Data
- * (13) Base Support Data

- b. **Input Records.** Input record nomenclature, source, expected volume, frequency, priority, degree of sensitivity and requirement for timeliness are described in the AFIRMS Product Descriptions Document. Interface specifications corresponding to input record requirements are provided in Table 3-5 of this subsystem specification. The transaction header interface specification detailed in Appendix A contains information to discriminate between input records and input data element transactions.
- c. **Input Data Elements.** Data elements for each input record type are described in the AFIRMS Database Specifications and the Data Requirements Document. Interface specifications corresponding to input data element requirements are provided in Table 3-5 and Appendix B of this subsystem specification. The transaction header interface specification detailed in Appendix A contains information to discriminate between input records and input data element transactions.

4.3.2 Outputs. Operational AFIRMS outputs include reports and graphic readiness measurement displays as follows:

- a. **Output Reports.** All AFIRMS output reports can be displayed on the user's terminal or printed as hardcopy. There are no requirements for preprinted forms for generation of hardcopies.

Output reports to be prepared by the TFW subsystem provide graphic and/or tabular product screens that display readiness information and measurements as well as scheduling information. Many wing output products assist the wing user in day-to-day operations and provide scheduling capability as well as data entry assistance.

Table 4-1 provides information concerning the format, complexity, security classification, and estimated daily volume and frequency of AFIRMS output reports. For response times of these AFIRMS output reports, please reference Section 2.2.3 of this subsystem specification, in which AFIRMS query response times are provided for varying degrees of query complexity.

Table 4-2 details the primary and secondary functional area users of AFIRMS output reports. In addition, these outputs are fully described in the AFIRMS Product Description series. (Additional output report requirements for each Wing will be reviewed during the in-depth analysis that precedes implementation at that site.)

- b. **Output Data Elements.** Output data elements are described in the AFIRMS Database Specifications and the interface specifications are provided in Appendix B of this subsystem specification.

TABLE 4-1

AFIRMS OUTPUT REPORTS

Screen Title	Format	Estimated Daily Volume and Frequency	Complexity	Security Classification
AGE Availability Status	Tabular	2 pg @ 12	Simple	Unclas
AGE Support Capability	Graphic	1 pg @ 6	Medium	Secret
Aircraft Availability	Graphic	1 pg @ 12.5	Medium	Conf
Aircraft Capability	Graphic	1 pg @ 12	Medium	Secret
Aircraft Status	Tabular	6 pg @ 200	Medium	Unclas
Aircraft Tasking	Graphic	1 pg @ 5	Medium	U-S*
Aircrew Availability	Tabular	1 pg @ 31	Medium	Conf
Aircrew Capability	Graphic	1 pg @ 12	Complex	Secret
Aircrew Generation	Graphic	1 pg @ 31	Medium	Unclas
Aircrew Status	Tabular	2 pg @ 63	Simple	Unclas
Airfield Status	Graphic	1 pg @ 48	Simple	Unclas
Base Fuels Capability	Graphic	1 pg @ 6	Medium	U-S*
Base Status	Tabular	3 pg @ 48	Simple	Unclas
Flying Schedule (Maintenance)	Tabular	6 pg @ 200	Medium	Unclas
Flying Schedule (Operations)	Tabular	6 pg @ 100	Medium	Unclas
Fuels Capability	Graphic	1 pg @ 6	Medium	Secret
Fuels Status	Tabular	1 pg @ 60	Simple	Unclas
Fuels Status Map	Graphic	1 pg @ 48	Simple	Unclas
Individual Resource Capability	Graphic	1 pg @ 9	Complex	U-S*
Integrated Capability	Graphic	1 pg @ 6	Complex	U-S*
Maintenance Support Capability	Graphic	1 pg @ 6	Medium	Secret
Mass Load Generation Schedule	Tabular	6 pg @ 120	Simple	Secret**
Mission Flow	Graphic	1 pg @ 24	Medium	Secret
Mission Profile Definition	Tabular	3 pg @ 3	Simple	U-S
Munition Flow	Graphic	1 pg @ 24	Medium	Secret
Munitions A & D Availability	Tabular	2 pg @ 6	Simple	Unclas
Munitions Assembly Capability	Graphic	1 pg @ 6	Medium	Secret
Munitions Availability Forecast	Graphic	1 pg @ 9	Simple	Unclas
Munitions Capability	Graphic	1 pg @ 6	Medium	Secret
Munitions Distribution Capability	Graphic	1 pg @ 6	Medium	Secret
Munitions Load Capability	Graphic	1 pg @ 6	Medium	Secret
Munitions Load Crew Available	Tabular	6 pg @ 12	Simple	Unclas

Note 1: Depending on input parameters, some times will increase/decrease depending on the amount of data retrieved. For example, requesting Munitions Capability for 60 days will double the amount of data and time over a 30 day parameter input.

Note 2: One page @ 1 denotes that the average screen length (volume) is one page, and it is used once daily.

* Some classifications have a range, i.e., U-S, meaning Unclassified through Secret. That range normally results from a variable tasking classification (e.g., some tasks are Unclassified, some are Confidential, some are Secret, etc.). Note that AFIRMS does not initially include Top Secret data at the wing level.

** SECRET when it contains actual completion times.

SOFTech

TABLE 4-1 (Continued)
AFIRMS OUTPUT REPORTS

Screen Title	Format	Estimated Daily Volume and Frequency	Complexity	Security Classif- cation
Munitions Load Crew Flow	Graphic	1 pg @ 12	Medium	Unclass
Munitions Status	Tabular	3 pg @ 9	Simple	Secret
OPlan/OPORD Associations	Tabular	1 pg @ 1	Simple	Unclass
Order Assignments	Tabular	1 pg @ 1	Simple	U-S*
Process Status	Tabular	1 pg @ 6	Simple	Unclass
Refueling Capability	Graphic	1 pg @ 12	Medium	Secret
Refueling Truck Flow	Graphic	1 pg @ 12	Medium	Unclass
Single Aircraft Summary	Graphic	1 pg @ 300	Simple	Unclass
Supply MICAP Status	Tabular	1 pg @ 48	Simple	Unclass
Task Capability	Graphic	1 pg @ 12	Medium	Secret
Tasked Missions	Graphic	1 pg @ 8	Simple	Secret
Tasked Munitions	Graphic	1 pg @ 23	Simple	Secret
Tasking Information	Tabular	2 pg @ 120	Simple	Secret
Unit Status (Output)	Tabular	1 pg @ 65	Medium	U-S*
War Mobilization Plan	Tabular	1 pg @ 2	Simple	Secret
Wing Flying Day	Tabular	1 pg @ 2	Simple	U-S*
Wing Operations Rates	Tabular	1 pg @ 2	Simple	U-S*
Wing Resource Summary	Tabular	2 pg @ 2	Medium	U-S*
Wing Resupply Schedule	Tabular	4 pg @ 2	Simple	U-S*

TABLE 4-2

AFIRMS OUTPUT REPORTS BY FUNCTIONAL AREA USER

Screen Title (Implemented)	Primary User(s)	Supporting User(s)
Aircraft Availability	WOC	OPS, AMU, MOC
Aircraft Capability	WOC	OPS, MOC
Aircraft Status	MOC, WOC, AMU	OPS, FUELS CTL, MUN CTL, SUPPLY
Aircraft Tasking	WOC	OPS
Aircrew Availability	WOC	OPS
Aircrew Capability	WOC	OPS
Aircrew Generation	WOC	OPS
Aircrew Status	OPS	WOC
Base Fuels Capability	FUELS CTL, WOC	
Base Status (I/O)	WOC	FUELS CTL, MUNCTL, OPS, SUPPLY, MOC, AMU
Base Status Report (Rollup)	WOC	
Flying Schedule (Ops Seg 1)	WOC, OPS	AMU
Flying Schedule (Maint Seg 2)	MOC	OPS, FUELS CTL, AMU, MUN CTL, WOC
Flying Schedule Header File	MOC, WOC, OPS	
Fuels Capability	WOC, FUELS CTL	OPS
Fuels Status	FUELS CTL	SUPPLY, WOC
Individual Resource Capability	WOC	OPS
Integrated Capability	WOC	OPS
Order Assignments	WOC	OPS
Munitions Status	MUN CTL	WOC, OPS
Munitions Availability Forecast	WOC	MUN CTL, OPS
Munitions Capability	MUN CTL, WOC	OPS
Mission Profile Definition	WOC	OPS
OPLAN/OPORD Associations	WOC	OPS
Process Status	WOC	OPS
Resupply Schedule	WOC	FUELS CTL, MUN CTL
Supple MICAP Status	WOC, MOC	SUPPLY
Tasked Missions	WOC	OPS, MOC
Tasked Munitions	WOC, MUN CTL	OPS, MOC
Tasking Information	WOC	OPS, MUN CTL, MOC
Wing Flying Day	WOC	OPS
Wing Operations Rates	WOC	MOC, OPS
Wing Resource Summary	WOC	FUELS CTL, MUN CTL
Base/Unit Status Rollup	WOC	
Resource Rollup	WOC	OPS
Run SGM	WOC	OPS
Transmit Base Status	WOC	
Transmit Unit Status	WOC	
Transmit Resource Status	WOC	
War Mobilization Plan	WOC	OPS

TABLE 4-2

AFIRMS OUTPUT REPORTS BY FUNCTIONAL AREA USER (Continued)

Screen Title (Unimplemented)	Primary User(s)	Supporting User(s)
AGE Availability	MOC	AMU, MUN CTL, WOC
AGE Support Capability	MOC, WOC	
Airfield Status	WOC	OPS, MOC
Base Status Map	WOC, OPS	
Fuels (POL) Capability (Bar)	WOC, FUELS CTL	OPS
Fuels Status Map	FUELS CTL, WOC	
Maintenance Support Capability	MOC, WOC, AMU	OPS
Mass Load Generation Schedule	MOC, WOC	AMU, OPS, FUELS CTL
Mission Flow	MOC, WOC	MUN CTL
Munition Flow	MUN CTL, WOC	OPS, AMU, FUELS
Munitions A & D Availability	MUN CTL	AMU, MOC
Munitions Assembly Capability	MUN CTL	MOC, WOC
Munitions Capability (Bar)	WOC	WOC
Munitions Distribution Cap.	MUN CTL, WOC	AMU, MUN CTL
Munitions Load Crew Flow	AMU	MOC
Munitions Load Crew Status	AMU	WOC, MOC
Munitions Loading Capability	WOC, AMU	WOC, MOC
Refueling Capability	WOC, FUELS CTL	MUN CTL
Refueling Truck Flow	FUELS CTL	
Single Aircraft Summary	MOC, AMU	WOC, MOC
Task Capability	WOC	WOC, OPS, FUELS
Unit Status (I/O)	WOC	CTL, MUN CTL
		OPS, MOC, MUN CTL,
		FUELS CTL, AMU
		OPS

ABBREVIATIONS/ACRONYMS

AMU - Aircraft Maintenance Unit
 FUELS CTL - Fuels Control
 MOC - Maintenance Operations Center or Job Control Center
 MUN CTL - Munitions Control
 OPS - Wing & Squadron Scheduling/Training, Squadron Operations, Wing HQ
 WOC - Wing Operations Center (LRC, PRC, SRC, Sr. Battlestaff, Mission Director, Frag Shop)

4.3.3 Database Description. For additional AFIRMS database requirements, refer to the AFIRMS Wing Database Specification.

- a. Database Identification. The label by which the wing level database is uniquely identified consists of the wing number, wing mission type, and "DB" as a suffix (e.g., 52TFWDB). The wing subsystem maintains databases as follows:
 - (1) Real: This database contains peacetime and crisis tasking, and other day-to-day operational data.
 - (2) What If: This physical database is comprised of three types of logical databases:
 - (a) Exercise - This database contains data which provides a simulation of an actual crisis.
 - (b) Ad-Hoc What If -This database contains data which provides a simulation of a hypothetical crisis or situation.
 - (c) Historical - This database contains data which provides a historical view of the real, exercise, or ad-hoc what if databases.
- b. Storage. The master file(s) containing the wing level database are stored on-line on mass-storage disk devices and off-line on magnetic tape and formatted floppy/microfloppy disk.
- c. Database Query Capabilities. The design of the AFIRMS database supports the requirements for an interactive query capability accessing current and/or what-if data for the above-named databases. Historical data resides primarily on off-line media and is copied to on-line media on an "as-needed" basis.
 - (1) Ad-Hoc Querying. Selected users may execute ad hoc queries against any on-line databases to which they are permitted access. Ad hoc querying is constrained by AFIRMS security and control requirements. This capability is limited to databases located at the functional area and the central location within a site. Controls within the DBMS and security software are used to limit access to both the functional area and central database on a user-by-user basis.

Ad hoc query access is provided by the AFIRMS executive. The user has the ability to interactively query the database via an "English-like" AFIRMS query utility. The user does not have the ability to update any data while in this mode. Ad hoc queries are limited to current or crisis mode data only. When data is requested, if it is not present in the local functional area database, the request is transmitted to the central node. The request is then processed at the central node and the results returned to the requesting functional area for display. There is no capability for ad-hoc querying across sites within AFIRMS.

- (2) **What-If Capability.** A what-if capability exists in AFIRMS to enable certain users to input hypothetical tasking, resource, or operations scenarios to better predict future readiness capability. The data is input into the local database through a highly structured AFIRMS environment. The what-if capability of AFIRMS directly affects the amount of data redundancy necessary at each site and, accordingly, the amount of physical storage capacity necessary to handle it. What-if data storage needs vary according to the level in the command structure and the functional users' what-if exercise needs.
- d. **Database Backup, Restoration, and Archiving.** Backup of the database to off-line media occurs on a daily, weekly, monthly, and yearly basis; each backup is maintained for a different length of time:
 - (1) **Daily Database Backups.** Daily backups are maintained for five working days.
 - (2) **Weekly Database Backups.** Weekly backups are maintained for five weeks.
 - (3) **Monthly Database Backups.** Monthly backups are maintained for 12 months.
 - (4) **Yearly Database Backups.** Yearly backups are maintained for five years.

Restoration occurs in the event that data in the database has been lost or damaged. Whenever a transaction occurs in the local database, it will be logged to a journal file for use in the event restoration is needed. Restoration consists of reloading the latest copy of the database from off-line media, if necessary, and applying the journal log file to it.

Archiving of data to tape or disk is accomplished as required by AFIRMS users.

- e. **Database Size.** It is estimated that the size of all files contained in each wing database is a total of approximately 1.6 megabytes.
- f. **Database Elements.** AFIRMS TFW database elements are described in the AFIRMS TFW Database Specification and Data Requirements Document.

4.4 Program Descriptions. This subsystem specification is to contain, as annexes, C-level program specifications which detail specific requirements for the subsystem functional products. The wing subsystem consists of the following programs (in addition to systems software):

Screen/Process Title

AGE Availability Status
AGE Support Capability
Aircraft Availability
Aircraft Capability
Aircraft Status
Aircraft Tasking
Aircrew Availability
Aircrew Capability
Aircrew Generation
Aircrew Status
Airfield Status
Base Fuels Capability
Base Status
Base/Unit Status Rollup
Flying Schedule (Maintenance)
Flying Schedule (Operations)
Fuels Capability
Fuels Status
Fuels Status Map
Individual Resource Capability (Exercise)
Integrated Capability (Exercise)
Maintenance Support Capability
Mass Load Generation Schedule
Mission Flow
Mission Profile Definition
Munition Flow
Munitions A & D Availability
Munitions Assembly Capability
Munitions Availability Forecast
Munitions Capability
Munitions Distribution Capability
Munitions Load Capability
Munitions Load Crew Available
Munitions Load Crew Flow
Munitions Status
OPLAN/OPORD Associations
Order Assignments
Process Status

Screen/Process Title

Refueling Capability
Refueling Truck Flow
Resource Status Rollup
Run Sortie Generation Model (SGM)
SGM Associations
Single Aircraft Summary
Supply MICAP Status
Task Capability
Tasked Missions
Tasked Munitions
Tasking Information
Transmit Base Status
Transmit Resource Status
Transmit Unit Status
Unit Status (Output)
War Mobilization Plan
Wing Flying Day
Wing Operations Rates
Wing Resource Summary
Wing Resupply Schedule

For detailed descriptions of these products, refer to the AFIRMS Product Descriptions Index and Document.

APPENDIX A. INTRASITE TRANSACTION HEADER

<u>Field Name</u>	<u>Field Description</u>
TRANS_ID	<ul style="list-style-type: none">a. Transaction identifier.b. Each terminal has its own IDs.c. The legal values are 1-->65535. After 65535, it reverts back to 1.
TRANS_MSG_LEN	<ul style="list-style-type: none">a. Transaction message length.b. The length is the sum of the transaction header plus data length.c. The legal values are 85-->8192.
REQ_REP_FLAG	<ul style="list-style-type: none">a. Request/Reply flag.b. User interactive display software always sends requests. The host always sends replies in response to the request as long as the transaction was not submitted as a batch job. The host occasionally sends unsolicited requests to the CGC (i.e., update messages). It does not expect a reply.c. The legal values are "Q" for request and "P" for reply.
JOB_TYPE	<ul style="list-style-type: none">a. Interactive/Batch/Network flag.b. All jobs must run interactively if they expect a product screen display. Otherwise, they can be run as batch. Note: batch jobs never send back replies. Their status can be monitored through the batch monitor screen.c. The legal values are "I" for interactive, "B" for batch, and "N" for network.
SRC_NODE_ID	<ul style="list-style-type: none">a. Source node ID.b. This is the node ID of the requestor.
SRC_TERM_ID	<ul style="list-style-type: none">a. Source terminal ID.b. This is the terminal ID of the requestor.c. The legal values are local site dependent. Note: the value 1111 is reserved for host generated transactions (i.e., unsolicited update messages).
SRC_USER_NAME	<ul style="list-style-type: none">a. Source username.b. This is the username of the requestor.c. The legal values are site dependent. They must match the username used for logging into the host.
DST_NODE_ID	<ul style="list-style-type: none">a. Destination node ID.b. This field is filled in by a transaction router. It is the same as the SRC_NODE_ID for the local requests that require a reply. In general, it is always the node ID of where the transaction is destined. It differs from the SRC_NODE_ID only for network messages.

<u>Field Name</u>	<u>Field Description</u>
DST_TERM_ID	<ul style="list-style-type: none"> a. Destination terminal ID. b. This field is filled in by a transaction router. It is the same as the SRC_TERM_ID for the requests that require a reply. In general, it is the terminal ID of where the transaction is destined. It differs only for network messages. c. The legal values are remote site dependent.
DST_USER_NAME	<ul style="list-style-type: none"> a. Destination username. b. This field is filled in by a transaction router. It is the same as the SRC_USER_NAME for the requests that require a reply. In general, it is always the username of where the transaction is destined. c. The legal values are site dependent. They must match the username used for logging into the host for local transactions. For network, transactions, the username "*ROLLUP*" is reserved.
EXP_DAT_TIM	<ul style="list-style-type: none"> a. Transaction expiration date/time. b. There are four subfields: <ul style="list-style-type: none"> 1. Expiration year <ul style="list-style-type: none"> b. The legal values are 0 -- > 99. 2. Expiration day <ul style="list-style-type: none"> b. The legal values are 1 -- > 366. Note: 366 is only valid for leap years. 3. Expiration hour <ul style="list-style-type: none"> b. The legal values are 0 -- > 23. 4. Expiration minute <ul style="list-style-type: none"> b. The legal values are 0 -- > 59.
MOD_REQ_ID	<ul style="list-style-type: none"> a. Module request ID. b. This field is looked at only by the transaction routing mechanism to determine whether the transaction is destined for the database server or somewhere else. c. The legal values are 1 -- > 2. Their meanings are as follows: <ul style="list-style-type: none"> 1 = forward transaction to the database router 2 = AFIRMS service request
FUNC_REQ_ID	<ul style="list-style-type: none"> a. Function request ID. b. This field is looked at by the transaction routing mechanism only when MOD_REQ_ID = 2. It signifies what AFIRMS service to perform. Currently, the only service is to log off the user. c. The legal values are 1 -- > 10. Their meanings (when MOD_REQ_ID=1) are as follows: <ul style="list-style-type: none"> 1 = organize records (send transaction #2) 2 = update record 3 = insert record 4 = delete record 5 = logoff Database 6 = edit info (send transaction #1) 7 = insert continuation record 8 = delete continuation record 9 = log invalid batch job 10 = transmit rollup status

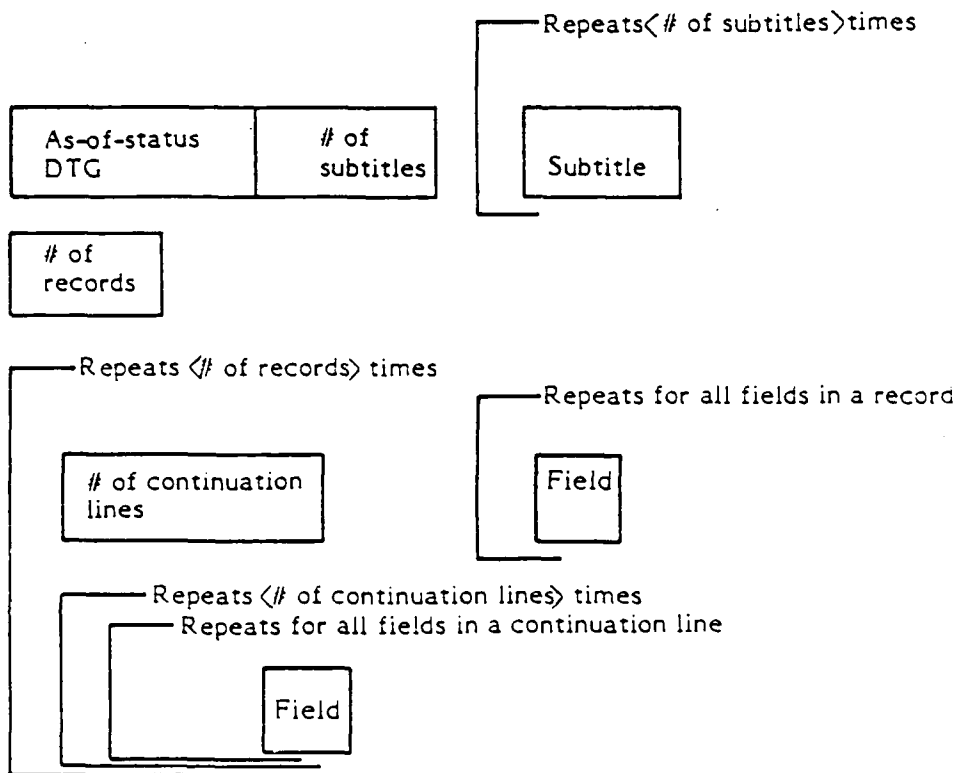
<u>Field Name</u>	<u>Field Description</u>
MSG_PRIO	<ul style="list-style-type: none"> a. Message priority. b. This field is used by the process controller to put each transaction it receives into the appropriate priority mailbox (i.e., queue). <ul style="list-style-type: none"> (1) The transaction router uses it as a consistency check to make sure the transaction is sent to the right mailbox, and (2) to set the priority of the Database server that will be processing that transaction, and (3) The Database server uses it to determine to which priority mailbox it should forward replies. c. The legal values are 1 for low priority, 5 for medium priority, and 9 for high priority.
MSG_STAT	<ul style="list-style-type: none"> a. Message status. b. This field is used for returning the status of a user's request. c. The legal values are any 32-bit number. Note: MSG_STAT must be initially set to 0 in the original request.
MSG_SEG_CUR	<ul style="list-style-type: none"> a. Message number current. b. This field is the current message segment number. It is always 1 unless there is a multi-part transaction (i.e., one that must split because it is too large for a single buffer). c. The legal values are 1 -->255.
MSG_SEG_TOT	<ul style="list-style-type: none"> a. Message number total. b. The legal values are 1 -->255.

APPENDIX B

B.1 Data Interface Specification (GENEDIT)

Date: 31-May-1985

Screen Classification	Current Time-of-day DTG	Oldest screen value DTG	Latest screen value DTG	As-of-status DTG flag
-----------------------	-------------------------	-------------------------	-------------------------	-----------------------



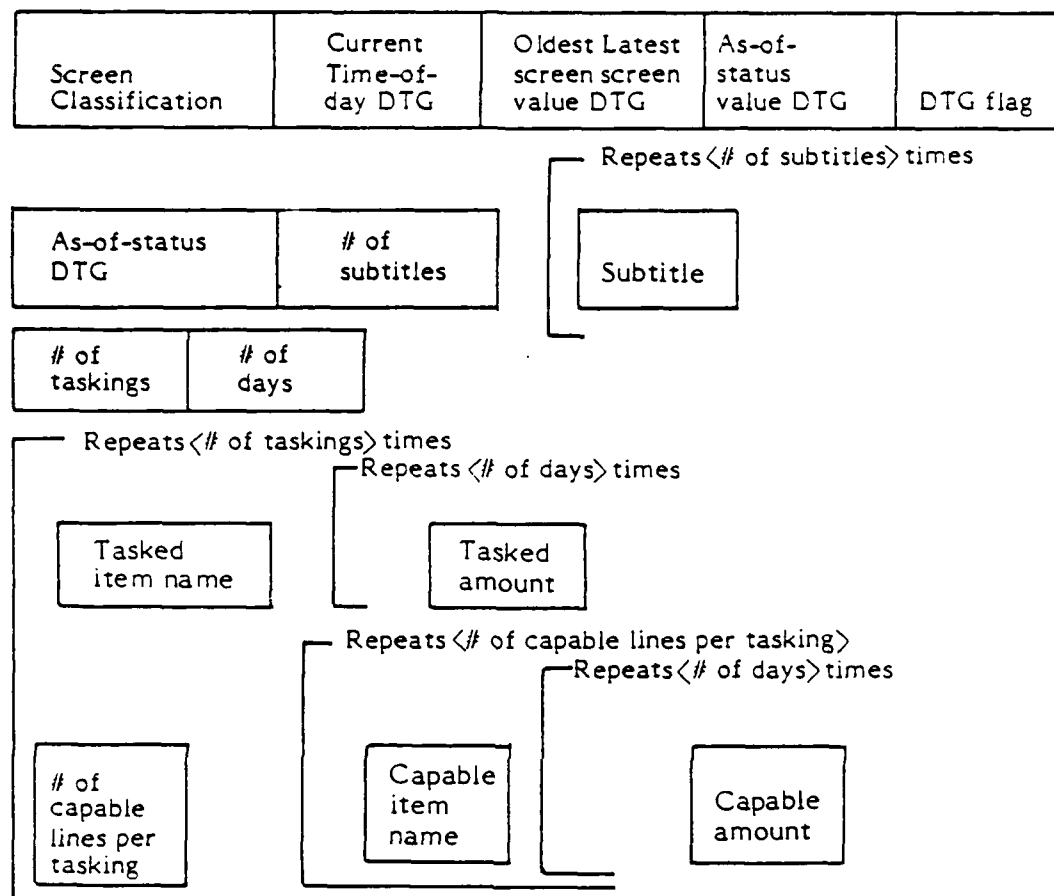
Field Name	Field Length
Screen classification	1
Current time-of-day DTG	16
Oldest screen value DTG	16
Latest screen value DTG	16
As-of-status DTG flag	1
As-of-status DTG	?
# of subtitles	2
Subtitle	?
# of records	3
# of continuation lines	2
Length of field	2
Field	?

- Note: (1) Each field whose length is "?", represents a variable length field. The fields are preceded with a 2-byte length descriptor.
 (2) The number of fields in a record or a continuation line is screen specific.

B.2 Data Interface Specification (CAPABILITY)

Date: 31-May-1985

The AREA-C buffer layout for CAPABILITY SCREENS is as follows:



Field Name	Field Length
Screen classification	1
Current time-of-day DTG	16
Oldest screen value DTG	16
Latest screen value DTG	16
As-of-status DTG flag	1
As-of-status DTG	?
# of subtitles	2
Subtitle	?
# of taskings	3
# of days	3
tasked item name	?
tasked amount	?
# of capable lines per tasking	?
capable item name	?
capable amount	?

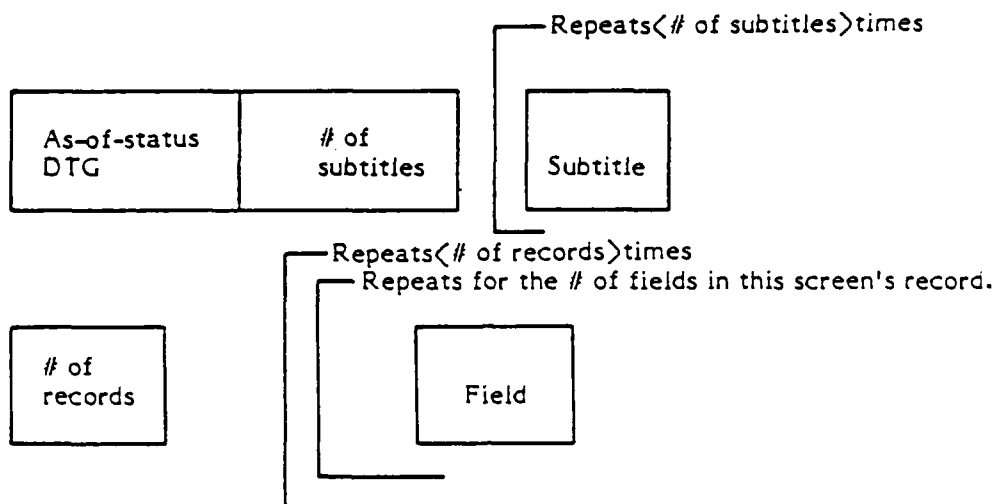
Note: Each field whose length is "?", represents a variable length field. The fields are preceded with a 2-byte length descriptor.

B.3 Data Interface Specification (MAP)

Date: 31-May-1985

The AREA-C buffer layout for MAP SCREENS is as follows:

Screen Classification	Current Time-of-day DTG	Oldest screen value DTG	Latest screen value DTG	As-of-status DTG flag
-----------------------	-------------------------	-------------------------	-------------------------	-----------------------



Field Name	Field Length
Screen classification	1
Current time-of-day DTG	16
Oldest screen value DTG	16
Latest screen value DTG	16
As-of-status DTG flag	1
As-of-status DTG	?
# of subtitles	2
Length of subtitles	2
Subtitle	?
# of records	3
Length of field	2
Field	?

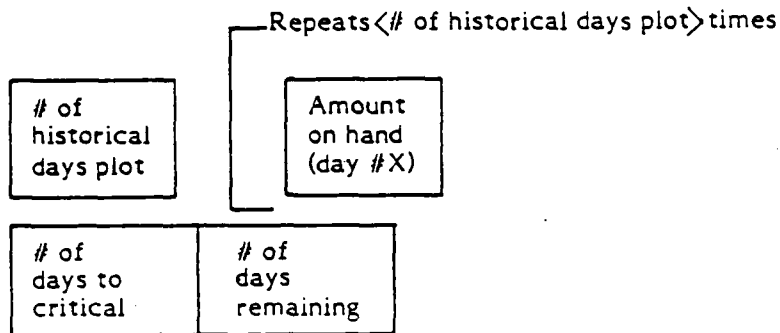
- Note: (1) Each field whose length is "?", represents a variable length field. The fields are preceded with a 2-byte length descriptor.
 (2) The number of fields in a record is screen specific.

B.4 Data Interface Specification (FORECASTS)

Date: 31-May-1985

The AREA-C buffer layout for AVAILABILITY FORECAST SCREENS is as follows:

Expenditure rate	Historical average flag	# of historical days avg.	Critical level	# of forecast days	# of offbase locations
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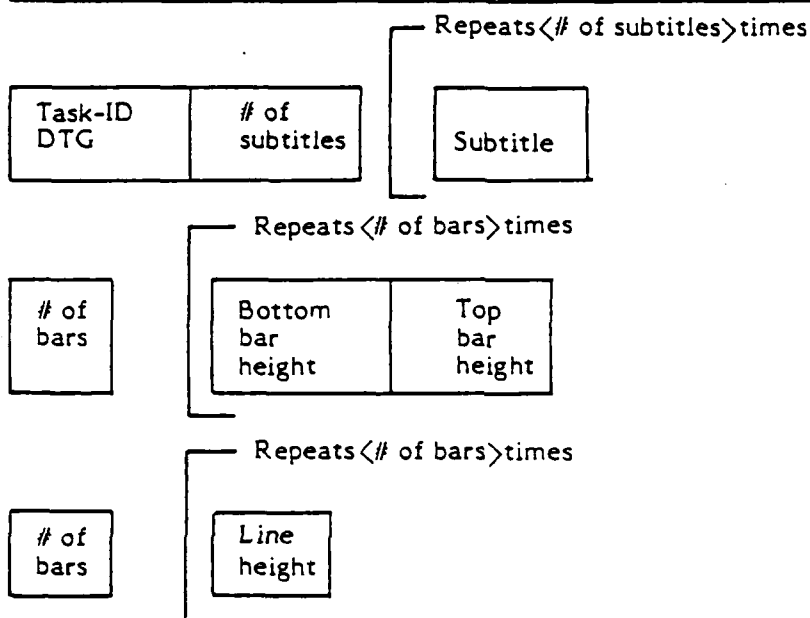


Field Name	Field Length
Screen classification	1
Current time-of-day DTG	16
Oldest screen value DTG	16
Latest screen value DTG	16
As-of-status DTG flag	1
As-of-status DTG	?
# of subtitles	2
Subtitle	?
Expenditure rate	?
Historical average flag	1
# of historical days avg.	3
Critical level	?
# of forecast days	3
# of offbase locations	1
# of historical days plot	3
Amount on-hand (day #1-n)	?
# of days to critical	3
# of days remaining	3

Note: Each field whose length is "?", represents a variable length field. These fields are preceded by a 2-byte length descriptor field.

The AREA-C buffer layout for BAR CHART WITH LINE SCREENS is as follows:

Screen classification	Current Time-of-day DTG	Oldest screen value DTG	Latest screen value DTG	Task ID DTF flag
-----------------------	-------------------------	-------------------------	-------------------------	------------------



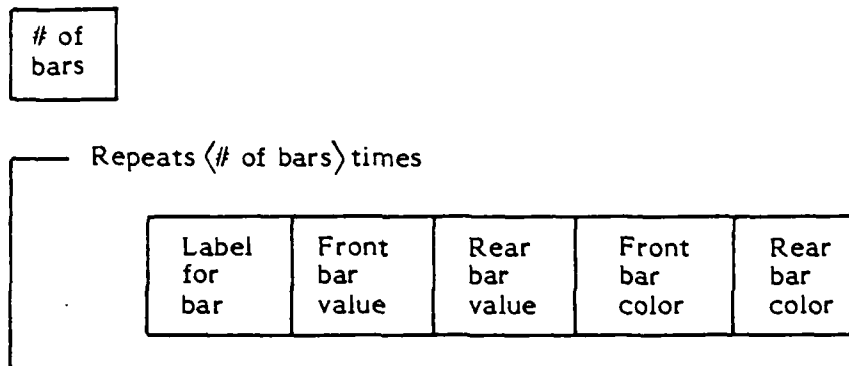
Field Name	Field Length
Screen classification	1
Current time-of-day DTG	16
Oldest screen value DTG	16
Latest screen value DTG	16
Task-ID DTG flag	1
Task-ID DTG	?
# of subtitles	2
Subtitle	?
# of bars	3
Bottom bar height	?
Top bar height	?
Line height	?

Note: Each field whose length is "?", represents a variable length field. Only these fields shall be preceded by a 2-byte length descriptor field.

B.6 Data Interface Specification (BAR CHART)

Date: 31-May-1984

The AREA-C buffer layout for BAR CHART SCREENS is as follows:



Field Name

Field Length

# of bars	3
Label for bar	?
Front bar value	?
Rear bar value	?
Front bar color	3
Rear bar color	3

Note: Each field whose length is "?", represents a variable length field. These fields are preceded by a 2-byte length descriptor field.

END

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